THE FLORA OF THE SOUTH INDIAN HILL STATIONS

OOTACAMUND, COONOOR, KOTAGIRI, KODAIKANAL, YERCAUD

AND THE COUNTRY ROUND

17 FEB 19

BY

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VOLUME I

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PREFACE

IN 1914, I published a "Flora of the Nilgiri and Pulney Hill-Tops," in two volumes, one of letterpress, the other of plates, in which were described the flowering plants of the down or uplands only of these mountains. It was soon realized that this was too restricted a range, and, in order to include more plants from the Kotagiri and Coonoor areas and also to add a large number of new figures drawn by my wife, a supplementary third volume was issued in 1920.

The publication of the official Flora of the Madras Presidency by the late Mr. J. S. Gamble and on his death by Mr. G. E. C. Fischer, with re-determinations of many of the species, made it necessary to revise some of the names but I have had to leave the grasses as they were that part of the Madras Flora has not yet appeared. the same time, it seemed worth while to include the plants about Yercaud, for a great many of the species described occur there, and this is one of the hill stations to which people go in summer. The number of species has risen in consequence from the 483 of the first volume to 877 in the present work; the genera also from 264 to 429, and they belong to 116 families as compared with 95. After discarding about 20 of the plates as unnecessary and adding 60 fresh figures, those of the issues have been rearranged in one serial order. With these changes a new title seemed called for; so it is now the Flora of the South Indian Hill Stations.

The present work is by no means a mere compilation of the old with the addition of new matter. Many of the former descriptions have been rewritten; most have been shortened, some considerably. New keys have been constructed to the genera; new localities given for the species. I should have liked to work over the localities more fully, but time has not allowed. Some species have been inserted on the authority of the official Flora of the Presidency. These are acknowledged by [G.F.M.P.] or [F.M.P.] after the distribution: but there are not many of these, for except the Shevaroys which I think still needs further work, these areas are well represented in the collections at the Presidency College made by myself or by Sir Alfred and Lady Bourne before me. As in my former work the arrangement of the families, genera and species follows that of the Flora of British India and reference is made to the descriptions in that work, both by the page and by the number of the family, genus or species, or where the species was not in the F.B.I. by the number starred to which it should come next. I have followed (but with a few exceptions noted on page xvii) the naming given in the official Flora of the Madras Presidency. Reference to the individual sheets in the College herbariums has been dropped as that seems now to serve no useful purpose.

Of the 611 illustrations, half are by my wife, 90 by Lady Bourne, about 80 by R. Natesan, 50 by myself, 20 by Mrs. Harrison and the remainder by different people, chiefly friends of Lady Bourne. It is impossible sufficiently to thank these ladies for their very valuable contribution.

I have to thank Mr. V. Narayanaswami, Mr. Jacob and the staff of the Madras Herbarium at Coimbatore for

help in determining plants and for lending sheets named for the official Flora of the Presidency and Mr. Mayuranathan of the Madras Museum for information and some new records. To Mr. E. C. Barnes I owe notes on recently described species of Impatiens, and two mentioned on page 84 as perhaps new. Probably no one has searched so diligently for species of these genus on the edge of the Nilgiri plateau. Miss Lechler sent me fresh specimens of *Rotala Fysonii* till then not collected on the Shevaroys, and of the new *Notonia shevaroyensis*; and the help of other friends too numerous to mention is also gratefully acknowledged.

I was very greatly assisted in this revision by Mr. A. Srinivasayya, the herbarium-keeper of the Presidency College. Every day for the last few months, Sundays and holidays, he has come early and stayed late to help me with the sheets before and after my ordinary college hours. To Mr. T. V. Narasinga Rao, who read through the proofs, my debt is also very great. I doubt if the work could have been done in the time without such help.

P. F. F.

CONTENTS

	PAGE
Preface	iii
Glossary of the commoner botanic terms used	x
Note on botanical nomenclature	xiii
Changes in names of genera	xv
Species extra to or named differently from those in the Flora of the Madras Presidency	xvii
Key to the families and certain abnormal genera or species ...	xix
Descriptive text	1
Appendix	683
Index	685

17 FEB 1933

NOTE ON BOTANICAL NOMENCLATURE.

It may perhaps be of interest to some users of this book, and may make the changes in the names of plants which are shown in this volume appear more reasonable, if I briefly explain the principles underlying the scientific naming of plants. Every kind, or species, of plant or animal is known by a double name, the second being the special or individual name of the species and the first that of the group or genus to which the species obviously belongs. This system was introduced by Linnaeus in the eighteenth century, and fits in so well with the natural relationships of the varied forms of life that it has been universally adopted. Its usefulness is unquestioned.

The second, species name, is always that given to it by the man who first scientifically described the species, i.e., 'founded' it, and is in general unalterable. The only valid reason for changing the name of a species is the discovery that the name had already been given to another species of the same genus, or that the supposed new species is not really distinct from an older-named species. For the first reason the South Indian Asparagus subulatus *Steudel* has had to be changed to Asparagus Fysoni *MacBride* (page 608) and for the second Derris oblonga has been 'reduced' to Derris canarensis (page 177). The decision on second of these reasons must necessarily be to some extent a matter of opinion, as also sometimes whether a certain plant does really belong to a pre-existing species (perhaps as a 'variety') or should be considered distinct. The tendency at the present time is to split off varieties or distinct species. (See the species of the Sect. *Alatæ* of CROTALARIA in Volume I, page 139 et seq.).

The first of the names is the genus to which the species belongs. It also is the name first scientifically given to that genus. The same rules apply as with species. Thus ZEHNERIA (of the F.B.I. 1) was merged in (reduced to) MELOTHRIA a few years ago, and MUKIA is now following suit (see page 242). BRASSAIA, a genus founded by Clarke, is now judged to be not

really distinct from HEPTAPLEURUM, and the latter name has had to give way to the earlier SCHEFFLERA. Sometimes, on the other hand, a genus—formed perhaps by the amalgamation in this way of several—becomes so large that it is convenient to split it up again. For this reason ANDROPOGON has been divided into seven or eight genera (see page 665) and now EUGENIA also into smaller genera, of which one genus belong to SYZYGIUM (page 219).

Very occasionally the merging of one genus in another means that the name of a species must be changed too, so as to avoid having two of the same name in the genus or the converse may happen, and on account of a change in the genus the species name previously 'reduced' may now be restored: but both these changes are rare.

After the two names it is customary to add the name of the author of the combination, so as to obviate confusion between the plant meant and another to which the same names have perhaps been given in ignorance or error by a later botanist.

It will thus be seen that however much we may sometimes be inclined to deplore the passing away of some well-established name or the use of new and strange one, changes are made only when necessitated either by historical research or by a change of view brought about by fresh discoveries: and though these due to purely historical reasons must become fewer and fewer till in time they finally cease to appear, so long as the science is a living one there must always be new discoveries and new points of view. The systematic naming of plants can no more be fixed than any other branch of science.

CHANGES IN NAMES OF GENERA.

Former name.	New name.
Heptapleuron	Schefflera.
Hedyotis	Oldenlandia.
Canthium	Plectronia.
Myrsine	Rapanea.
Viscum (part only)	Korthasella.
Loranthus (do.)	Elytranthe.
Habenaria (do.)	Peristylus.
Do. (do.)	Platanthera
Do. (do.)	Phyllomphax.

The first four names disappear from our Flora; to the remaining three some species remain but others are separated in the new genera.

SPECIES EXTRA TO OR NAMED DIFFERENTLY FROM THOSE IN THE FLORA OF THE MADRAS PRESIDENCY.

Rotala Fysonii *Blatter and Hallberg* (Appendix) described in Journal of the Bombay Nat. Hist. Soc. XXV.

Osbeckia rosea *Fyson* (page 225), described in Jour. Botanical Soc. India, 1932.

Notonia shevaroyensis *Fyson* (page 345) do. do.

Dichrocephala chrysanthemifolia *DC.* to include D. latifolia *DC* (page 317) as in Fa. Nl. & P. Ht.

Blumea Macrostachya (page 324) a 'variety' raised.

Disperis zeylanica (page 596).

Eriocaulon Mariæ *Fyson*, described in Kew. Bull 1914 reduced in S.I.B.S., Volume II, now restored.

Smilax zeylanica *L.* (page 606), restricted.

Smilax macrophylla *Roxb.* (page 607), reduced in F.M.P. to S. zeylanica.

17 FEB 1933

THE FLORA OF THE SOUTH INDIAN HILL STATIONS.

RANUNCULACEÆ.

THE predominant feature of the flower of this family is the spiral arrangement on a convex centre (*torus*) of the numerous stamens and carpels, the latter being quite free of each other even in fruit. The flowers may be solitary at the ends of the branches, or in cymes, or occasionally in racemes, and are usually showy. Often there is no marked difference between the sepals and petals, the former being coloured ; and in some genera there are no petals, the sepals supplying all the colour, as in Clematis and Anemone. The plants are mostly perennial herbs with stout rootstocks and alternate, mostly radical, leaves which are often characterized by a sheathing base to the stalk and irregularly parallel or palmate venation ; but Clematis is an exception. Among garden plants are various species of Anemone (including the Hepaticas), Clematis, Monk's Hood, Larkspur, Pœony, and Columbine.

The family consists of 70 genera and about 700 species, nearly all in the northern temperate regions, or (a few only) on high mountains in the tropics and south temperate. One species, however, Naravelia zeylanica, *DC*, allied to Clematis, grows in Madras. With the exception of these two genera there are only three rare species between the southern high lands of the Western Ghauts and the Himalayas : even on the hills of Mysore, Bombay, or the United Provinces.

KEY TO THE GENERA.

Climbing plants with opposite compound leaves and the achenes (carpels in fruit) ovate and tailed. No petals. Sepals four, white or coloured. (Travellers' Joy). CLEMATIS.

Similar to CLEMATIS but petals narrow green, sepals shorter, achenes narrow . . . . NARAVELIA.

Ground herbs. Stem with two or three leafy bracts a few inches below the flowers. Achenes longer than broad and beaked. No petals . . . . ANEMONE.

Ground herbs. No involucre of leaves below the flower. Achenes not much longer than broad. Sepals and petals. (Buttercup) . . . . RANUNCULUS.

Tall well-branched herbs with smooth slender stem and leaves like (Maiden Hair). No petals. Sepals soon falling and leaving only a fluffy ball of white stamens. . THALICTRUM.

CLEMATIS. F.B.I. I I.

Travellers' Joy, etc.

Thin stemmed woody plants climbing by leaf-stalks coiling round the support. Leaves opposite, pinnately or ternately compound. Flowers axillary or terminal, solitary or panicled, without bracts and without petals, but with sepals (usually 4), often highly coloured and large. Carpels many, one-ovuled, ripening into achenes (containing only one seed and not opening) with long feathery tails.

Species about 180, almost all over the temperate and, less commonly, tropical regions of the world.

Named after the Greek, from the word KLEEMA (*a climber*), *but the Greek name* KLEEMATIS *was given to other climbers as well.*

In Europe the commonest wild species is C. vitalba *Linn.*; *Eng.* Travellers' Joy, Old Man's Beard, or Virgin's Bower ; *Ger.* Waldrebe ; *Fr.* Consolation, Vigne blanche, Berceau de la tres-sainte Vierge ; which flowers in the autumn. Several others are grown in gardens.

KEY TO THE SPECIES.

a { Leaflets very hairy. Flowers 2 inches, cream or pale yellow. **t. 1.** . . . . C. Wightiana.
Leaflets smooth or nearly so . . . . *b*

b { Flrs. many, small, white ; leaflets 3 or more. C. Gouriana.
Flrs. usually 3, nodding, brown on back. C. Munroana.
Flower solitary, red inside, hairy . . . C. theobromina.

Clematis Wightiana *Wallich Cat.* 4674 *! ; F.B.I.* i 5, I 15 ; a woody climber with opposite pinnate leaves compounded of three to five softly hairy leaflets, and axillary panicles of cream-coloured flowers. Leaflets ovate, lobed or cut into rounded teeth with short points, hairy on both sides, densely so on the lower ; veins conspicuous. Panicles of flowers up to 12 inches or more ; buds globular, of strongly veined sepals ; flowers when fully open 2 inches across. Sepals four, yellow or cream-coloured above, pale or yellowish green on the back. Stamens hairy below the middle. Fruiting carpels with long grey fluffy tails. **t 1.** Wight Sp. Nilg. t. 30 ; Ic. t. 955.

On thickets and small trees on the edges of sholas. Nilgiris : near Ootacamund, flowering November-February ; Avalanche. Pulneys : below Kodaikanal. Shevaroys common.

Gen. Dist. Higher levels of the Western Ghauts, Mahabaleshwar (Dalzell !). Nearest ally appears to be C. sinensis of Ceylon.

Clematis Munroana *Wight ; F.B. I.* i 3, *under* C. smilacifolia *Wall.* ; I 6 ; a climber with three glabrous, ovate-acute, entire leaflets, and large white nodding flowers which are velvety brown outside, in stalked cymes of three. Connective of stamens continued beyond anthers, filaments narrow.

Coonoor on Lamb's Rock, Shemboganur and similar levels.

Gen. Dist. Coorg, Anamalais, etc. (G.F.M.P.).

C. smilacifolia Wall belongs to Ganjam and Kanara.

Clematis theobromina *Dunn* ; Kew Bull. 1914. p. 181. Leaflets up to 5 inches. Flowers hairy, brown on backs, red inside. Filaments as broad as the anthers. Connective not produced.

Nilgiris : Coonoor, Neduvattam (March-September).

Clematis gouriana *Roxb ; F.B. I.* i 4, I 9 : Distinguished from others of our species by its numerous small white flowers, and sepals not brown on backs. Leaflets 3 or more, glossy on upper side, with veins prominent on the lower.

Nilgiris : on the Eastern plateau, Kodanad to below Coonoor. Shevaroys on upper plateau.

Gen. Dist. All hilly districts. Ceylon, Java, Philippines. Closely resembles C. vitalba (' Travellers' Joy ' of Europe).

NARAVELIA. F.B.I. II.

A very small genus, like CLEMATIS in growth, but with small greenish flowers.

Naravelia zeylanica *DC. ; F.B.I.* 16, II. 1. Leaves ovate, toothed or entire, nearly glabrous, and with prominent network of berries raised on the lower side when dry. Flowers numerous in compound panicles, petals cylindrical, $\frac{1}{2}$ inch or more green. Ripe achene about $\frac{1}{8}$ inch long, tail $1\frac{1}{2}$ inches ; feathery.

Shevaroys : near Yercaud ; Horsleykonda and at lower levels in nearly all districts.

ANEMONE. F.B.I. I III.

Perennial herbs with an involucre of two or three leafy bracts a little below the flowers ; white or coloured sepals but no petals ; and numerous one-ovuled carpels ripening into achenes with hardened, hook-like style.

Species about 90 in temperate regions and mountains of the tropics ; a few only in South America, South Africa, and Australia.

Named from the Greek, ANEMOS, *wind, because most European species grow in windy places or flower at a windy time of the year, spring.*

Anemone rivularis *Hamilton ; F.B.I.* i 9, III 10, common wild Anemone : a perennial herb with well-branched stem ; leaves divided into three, and those of the flowering stems into narrow-toothed segments ; and large white flowers ; purplish outside. Carpels with short-hooked style, in fruit $\frac{1}{4}$ to $\frac{1}{2}$ inch, each with one seed. **t. 2.** Wight Sp. Nilg. t. 4, Ic. t. 936. (A. Wightiana.)

Everywhere on the upper levels, luxuriant in damp places, dwarfed in dry. Nilgiris : all over the plateau. Pulneys : in and above Kodaikanal.

Gen. Dist. Higher mountains of India 5,000 to 13,000 feet on the Sikkim Himalayas and 16,000 at Samlung (J. D. H. leaves nearly glabrous). In North Indian specimens the segments of the bracts are often broader, and near Simla is a form with umbelled flowers.

THALICTRUM. F.B.I. I IV.

Meadow Rue, etc.

Herbs with perennial rootstock, ternately multi-compound leaves, and racemes or panicles of yellow, purple, or white flowers, usually small but with numerous conspicuous stamens, numerous one-ovuled carpels ripening into ribbed achenes, imbricate sepals, and no petals. Differs from Anemone in having no involucre of leaves whorled just below the flowers.

Species about 76 almost all over the world outside tropical climates, more especially in Europe, Asia and America. In India only on the higher mountains where the climate is temperate.

Name from the Greek, THALLOS, *green, because of the bright green of the young shoots.*

Thalictrum javanicum *Blume ; F.B.I.* i 13, IV 16 (T. glyphocarpum W. & A. !) ; distinguished by its maiden-hair-fern foliage, and tall well-branched smooth stem ending in a loose panicle of fluffy balls of white stamens. Stem and branches slender, grooved, glabrous. Flowers $\frac{1}{4}$ inch across. Sepals soon falling. No petals. Stamens white, thickened upwards ; anthers not pointed. Achenes $\frac{1}{8}$ to $\frac{1}{6}$ inch with *short*, curved beak. **t. 3.** Wight Ic. t. 48, ex. stamens.

In damp places. Pulneys : in Kodaikanal in the swamp near Tinnevelly settlement, flowering summer. Nilgiris : on Dodabetta. Not on the Bombay Ghauts, north of the Nilgiris.

Gen. Dist. Anamalais, Ceylon, Sikkim, Simla and Khasia, Thibet and Java. As grown here the leaves are rather larger than those from Java.

RANUNCULUS. F.B.I. I VII.

Buttercup, etc.

Annual or perennial herbs with mostly radical leaves whose petiole has a distinct sheathing base ; and blade usually, but not always divided more or less completely into three wedge-shaped segments which again have teeth of various depths. Stem leaves small and less divided. Flowers solitary or panicled at the ends of the stem and leaf-opposed branches. Petals in all our species yellow, glossy, with a small pocket containing honey at the base ; Stamens numerous. Carpels many, one-seeded ; in fruit forming a globular head, and differing in the various species as regards thickness and surface markings.

A large genus of 160 species, scattered all over the world in temperate climates (in the tropics on mountains). In Britain there are fifteen species, known popularly as Buttercup, Celandine, Pilewort, Spearwort, Water-crowfoot, etc. India has

about twenty-one species, all but three on the Himalayas ; and none of our three indigenous species occurs north of the Nilgiris.

Named after the Latin RANA, *a frog, because several species grow in or near water.*

KEY TO THE SPECIES.

Leaves not deeply cut ; flowers a rich yellow. R. reniformis.
Leaves deeply cut but not to the base of the blade, carpels, covered with hooked spines . . . . . R. muricatus.
Leaves compound or cut to the base into three to five segments, which are again cut and toothed :—
Tufted plant ; sepals not reflexed. . . . R. subpinnatus.
Diffuse plant ; sepals reflexed . . . . R. Wallichianus.

Ranunculus reniformis *Wallich* 4709 *! ; F.B.I.* i 16, VII 4. Perennial herb, stem mottled red and green. Ground leaves rather thick, kidney-shaped or broadly ovate, crenate with red margin and white tips to the teeth, glabrous : Flowers yellow glossy. Petals variable in number. Achenes small massed into a compact nearly globular head. t. 4. Wight Ic. t. 75 ; Ill. t. 2.

In damp spots on the open downs, quite common. Pulneys : above and round Kodaikanal. Nilgiris : all over the plateau.

Gen. Dist. On the mountains of South India only. Its nearest ally appears to be R. sagittifolius *Hook.* of Ceylon which differs in the much more cordate base of the leaf ; and it links that species with R. lingua *L.* (*Eng.* Great Spearwort ; *Fr.* Douve ; *Ger.* Yungen Hahenfuss) which occurs in Kashmir and the Western Himalayas.

Ranunculus subpinnatus *Wight and Arnott* ; *Herb. Wight Prop.* ! *; F.B.I.* i 19, included in R. diffusus *DC.*, VII 15 ; an erect, tufted, glossy plant with large yellow flowers. Roots thick, white. Leaf blade divided into three or five distinct leaflets, glossy and sometimes almost glabrous on the upper side, often densely pilose below ; each divided more or less completely into three wedge-shaped segments, themselves cut and toothed, the ultimate

teeth with hardened tips pointing rather outwards. Flowering stems a foot high, hairy ; the lower leaves like the radical ones ; the upper smaller and with only three leaflets ; branches 2 to 4 inches, spreading. Flowers yellow ½ to 1 inch, petals round with numerous parallel veins. Sepals not reflexed. Achenes not as thick as broad, with distinct margin and finely pitted centre. **t. 5.** Wight Ic. t. 49.

Nilgiris : Ootacamund flowering July. Pulneys : Kodaikanal, May-September. A rather more delicate plant than the Ootacamund one.

The species was included in the *F.B.I.* under R. diffusus *DC.*, a species founded on a Nepal plant of Wallich's. I have not seen De Candolle's type sheet, but Wallich's R. diffusus *DC.* in Herb, Hook at Kew, is clearly a diffuse plant rooting at the nodes and with small, apparently white, flowers on leaf-opposed peduncles, in habit therefore much more like R. Wallichianus *W. & A.* Wight's R. subpinnatus *W. & A.* collected on the Nilgiris is a sturdier plant, not rooting at the nodes. I have, therefore, retained Wight and Arnott's name.

Ranunculus Wallichianus *Wight and Arnott ; Wight Herb. Prop. ! ; F.B.I.* i 20, VII 19 ; common Buttercup. A gregarious herb spreading by runners, with soft not glossy leaves, and small flowers. Roots thin and fibrous. Radical leaves digitately trifoliate, not glossy above, light green below, sparingly hairy on both sides and soft to the feel ; leaflets deeply cut into three segments which are again cut and toothed, the teeth pointing forwards rather than outwards and not ending in firm points. Flowering stems 3 to 4 inches only, their lower leaves three-fid but upper entire. Pedicels ½ to 1 inch. Sepals reflexed. Corolla ½ inch yellow. Achenes orange-tipped, with distinct margin and few and conspicuous warts on the sides.

Distinguished from R. subpinnatus. *W. & A.* by the diffuse habit, softer leaves, smaller flowers, reflexed

sepals, and shorter pedicels. **t. 6.** Wight Sp. Nilg. t. 5, Ic. t. 937.

In cool shady spots, very common, in and about both Ootacamund and Kodaikanal, and all over the two plateaus. In damp places succulent.

Gen. Dist. Mountains of South India and Ceylon. Allied to R. arvensis (*Eng.* Corn Celandine ; *Fr.* Ren depres) and also to the next species.

Ranunculus muricatus *Linn. ; F.B.I.* i 20, VII 20 ; distinguished by its deeply slit broad leaves and by the conspicuous spines on the comparatively large and flat achenes. A much larger plant than the two preceding, running to 2 feet in height. Radical leaves long stalked ; blades roundish cut to below the middle, but not to the base, into three lobes which are again cut in three or more teeth. Flowers terminal and leaf-opposed ; pedicels $\frac{1}{2}$ to 1 inch. Achenes $\frac{1}{5}$ to $\frac{1}{4}$ inch, with strong margin, hard curved beak, and spines perhaps $\frac{1}{20}$ inch long on the flat sides. **t. 7.**

In gardens and under hedges in Ootacamund, and in some sholas ; not indigenous.

Gen. Dist. A weed of cultivation, native of temperate America and Europe, but not England.

MAGNOLIACEÆ. F.B.I. 3.

The **Magnolieæ** (the greater number of the family) are trees with alternate simple leaves and large hood-like stipules which cover the buds and are pushed off as each expands, leaving scars round the axis. (The only other trees with such stipules are the Figs or Banyans and their allies, but they are quite different and are distinguished further by having a glutinous milk-white juice.) The flowers are large, of nine, twelve or fifteen sepals

and petals ; numerous slender stamens ; and a number of carpels arranged spirally on a convex or tall centre. This central *torus* may grow enormously and become a stalk 3 to 4 inches long, on which the carpels, now ¾ inch or more thick, look very much like the separate fruits of as many distinct flowers.

The family is a comparatively small one of about ten genera and seventy species, and has its home in the Atlantic States of America from Virginia to Lousiana and again in Japan and Eastern Siberia extending across China to the Himalayas. There appears to be only one species native to these hill-tops, but the American Tulip-tree or Lyre-tree, LIRIODENDRON, has been planted near Lovedale.

Named MAGNOLIA *in honour of Pierre Magnol, a Professor of Medicine at Montpellier* (*b.* 1638). *The anomalous genera outside the tribe* MAGNOLIEÆ *are by some placed in another family.*

MICHELIA. F.B.I. 3 VI.

Flowers large and bisexual ; anthers opening inwards ; *torus* stalked below the carpels (distinction from MAGNOLIA); ripe carpels opening widely to let out the seeds. Species sixteen, all on the tropical mountains of Asia (India, Malaya, China).

Named in honour of Antonio Micheli, a Botanist of Florence.

Michelia nilagirica *Zenk.* ; *F.B.I.* i 44, VI 8. Tree at a distance rather pale green devoid of shadows. Branches white ; twigs erect ; buds long, silky, leaves elliptic, acuminate, entire, hard, glabrous and shiny, flat and drooping. Flowers white or a pale cream colour, easily crushed and quickly fading. Stamens with very short swollen bases and slender ½-inch anthers with small tips. Fruiting *torus* erect, 3 to 4 inches ; carpels covered with white warts and opening by a slit beginning on the outer

side. Seeds two, red, the outer coat soft with a mango smell, inner hard ; completely filling the carpel ; funicle at first remarkably elastic. Wood yellow, valuable. **t. 8**. Wight Sp. Nilg. t. 6 ; Ic. t. 938 ; Ill. t. 5 (ex. carpels fruit and colour of flower).

In sholas, very common. Nilgiris : Ootacamund, Kotagiri, Avalanche, etc. Pulneys : Kodaikanal and above. Anamalais. Not apparently below 5,000 feet.

With reference to the distribution of the seeds, see note on Ternstrœmia japonica *Thunb.*, p. 53.

Michelia Champaca *Linn. ; F.B.I.* i 42, VI 2 ; a tall tree with leaves 6 to 10 inches long, tapering to a long point, and fragrant yellow or orange flowers is occasionally found in gardens, e.g., Trewin near the bund at Kodaikanal, and 'Bear's Cave' Garden on the Shevaroys ; but belongs to lower levels.

MENISPERMACEÆ. F.B.I. 5.

A family of slender twining plants with alternate leaves usually attached to the stalks inside the margin, small unisexual, diœcious, greenish flowers in axillary umbels and fleshy fruit with its stone and enclosed embryo curved into a horse-shoe or crescent shape. The parts of the flower are usually in sixes, except that there may be only one carpel, or in some species as many as twelve. The umbels of small flowers and the curved stone are the most characteristic features ; the latter gives the name to the family (*menis* = the crescent moon, *sperma* = a seed).

Genera 58. Species 200 ; in the warmer parts of the world.

As the plants are unisexual (flowers diœcious) they are often very difficult to determine. STEPHANIA is the only genus commonly found in our area, but others occur on the outskirts of it.

KEY TO THE GENERA.

a { Stamens free, or drupes 1 inch. Panicles large drooping . . . . DIPLOCLISIA.
Stamens united, anthers on rim of stalked disc or drupes ovoid . . . . b

Ovoid { Leaves peltate, smooth : flower-heads umbelled STEPHANIA.
Leaves peltate, hairy ; flowers in panicles . . CYCLEA.
Leaves cordate or kidney-shaped : sepals 4 spreading . . . . CISSAMPELOS.

DIPLOCLISIA.

Climbing plants with large drooping panicles, free stamens, globose anthers, a curved ovate seed, and cotyledons lying close against each other.

Species about 5 only, in tropical Himalaya and here.

Closely allied to COCCULUS (*F.B.I.* 5 X) but separated because of the drooping panicles and the centre of the endocarp reduced to a thin flat septum.

Diploclisia glaucescens *Diels.* ; *F.B.I.* as Cocculus macrocarpus *W. & A.*, i 101, X 1. A large climber, leaves round or broader than long, 5-nerved, glaucous beneath, 2 to 4 inches across, shorter than their stalks ; flowers yellow ; drupes reddish, obovoid 1 in. long.

Nilgiris and Pulneys in forests, up to 6,000 feet. (*G.F. M.P.*)

Gen. Dist. Western Ghauts.

STEPHANIA. F.B.I. 5 XII.

Leaves peltate, sepals six to ten ; petals three to five shorter ; stamens connected together as a column in the centre of the flower with a broad top along the edges of which the anthers open by horizontal slits ; carpel one

only with three-partite style; stone of fruit tubercled along the back, hollowed at the sides.

Species about 30, in Asia, Africa and South Australia.

Stephania japonica *Myers.;* formerly S. hernandifolia. *F.B.I.* i 103, XII 1. A twining plant thin and tender, or nearly $\frac{1}{2}$ inch thick and woody, with heart-shaped leaves attached inside the margin, and small heads, not $\frac{1}{4}$ inch across, of minute flowers, in stalked umbels of three to five heads. Distinguished at once by these characteristics from all our plants. Whole plant glabrous. Leaves and flowers on young shoots terminal and on the woody stems.

Blade usually $1\frac{1}{4}$ by $1\frac{1}{2}$ inches but up to 6 inches diameter (*F.B.I.*) broadly ovate, or triangular with the basal corners round, and veins radiating from the point of attachment. Stalks of umbels 1 inch, but variable; stalks of the heads 0 to $\frac{1}{4}$ inch, in the axils of small narrow bracts. Male flowers numerous, $\frac{1}{8}$ inch across or slightly more when fully expanded. Sepals six or eight, in two series, oblong. Petals opposite the outer sepals, about half as long, thick and concave. Staminal column $\frac{1}{20}$ inch high, expanded at the top round which the anthers open all in one line, horizontally. Ovary flowers similar, with one carpel only. Fruit a red glabrous drupe $\frac{1}{5}$ to $\frac{1}{4}$ inch; the stone inside horse-shoe shaped with tubercled ridges along the back and hollow sides. Seed inside annular with longitudinal cotyledons. **t. 9.** Wight Ic. t. 939. Sp. Nilg. t. 7 (Clyphea).

A lowland plant reaching the lower limits of our Nilgiri plateau, e.g., Kotagiri, Wellington. Very occasionally at the highest levels, e.g., on the exposed top of hill north of Vengadu, on the edge of the plateau at 7,200 feet. Shevaroys, Yercaud.

CYCLEA.

Very similar to STEPHANIA but our species distinguished by its narrow and hairy leaves.

Cyclea Arnotti *Miers.; F.B.I.* i. 104 as C. peltata *Hf. & T.* occurs near Yercaud.

Western Ghauts to Tinnevelly.

CISSAMPELOS.

A small genus of one or two species only.

C. Pareira *Linn.; F.B.I.* i 103, V 13. Leaves hairy underneath broadly cordate; the basal sinus much rounded: Flowers greenish in stalked cymose umbels. Drupe scarlet.

Shevaroys: near Yercaud: and down to the plains in all districts.

BERBERIDACEÆ. F.B.I. 6.

BERBERIS and MAHONIA the only genera here, as in Europe, of this family are distinguished by their yellow globular flowers, of rounded sepals and petals in four circles of three each; the six stamens, their anther lobes opening, not by slits as in nearly all other families but by large lateral flaps; and the ovary of one carpel only, which in fruit becomes fleshy and has one or more seeds.

The family is almost confined to the north temperate regions of Asia and America, being absent from Africa, south of Algeria, Australia, and the Pacific islands, and from all but the highest mountains of South America. There are forty-nine genera, and some 140 species in the tribe *Berbereæ*, and most of these occur on the Pacific coasts of North America and Northern Asia.

In Europe the best known species of Berberis is B. vulgaris *L.*, the common Barberry or Pipperidge, a hedge-row shrub, which was much

commoner before the discovery that it harboured the rust-disease of wheat. But several introduced species are common in gardens, as also of Mahonia.

Berberis is from an old Arabic name.

Leaves simple, in bunches just above a three-pronged spine. The common Barberry, etc. . . . . . . BERBERIS.
Leaves pinnate, radiating usually from the top of the stem ; leaflets prickly like Holly . . . . MAHONIA.

BERBERIS. F.B.I. 6 1.

Berberis tinctoria *Leschenault ; F.B.I.* i, 110, included in B. aristata *DC.* ; IV 4 ; common Nilgiri Barberry. A shrub, but very variable in size and form ; in the open often only 2 or 3 feet high, but in a shola sometimes reaching 15 feet with stem as thick as one's arm and long scandent branches bearing numerous slender leafy twigs ; wood very tough, bright yellow in colour. Leafy twigs green or purple, grooved and angular, studded with triple spines in the axils of which are tufts of leaves. Leaves when young purplish, obovate, entire or with a few spiny teeth, glabrous, 1 to 2½ inches. Racemes of flowers drooping, sometimes branched ; pedicels slender, red ½-inch ; petals notched. Berry sausage-shaped when young, eventually top-shaped, ⅓ by ⅙ inch, purplish red, turning to a dark-blue with glaucous bloom, with the dry style and large round stigma still attached. **t. 10.** Wight Ill. t. 8.

Distinguished from B. aristata *DC.* by the slender drooping pedicels and the shape of the fruit.

By roadsides, on the edges of and inside sholas ; quite common. Nilgiris : Ootacamund, Pykara, Kotagiri. Pulneys : Kodaikanal downs.

Schneider in Bull : de L'Herbier Boissier, Ser. 2. 5. 1905, p. 432 divides the Nilgiri specimens into three species, B. tinctoria, B. wightiana, and B. ceylanica, by the colour and surface of the under side of the leaves, the hairiness of the twigs, and the inflorescence. I am not, however, able to distinguish these, nor does Gamble in G.F.M.P.

MAHONIA.

Differs from Berberis in its pinnate leaves.
Species about 20.

Mahonia Leschenaultii *Takeda* (Berberis Leschenaultii *Wallich Cat.* 1479 !) *F.B.I.* i 109 included in B. nepalensis *Spr.*, IV 1 ; the Holly-leaf Barberry. Stem slender or stout, sometimes almost a tree with rough, greyish-brown, corky bark ; branches slender. Leaves in circles at the ends of the branches, 6 to 18 inches long, pinnate with two filiform stipules, $\frac{1}{6}$ to $\frac{1}{4}$ inch. Leaflets five to twenty-five in pairs, with one terminal, increasing in size towards the end and in shape from polygonal close to the base (like a pair of large stipules) to ovate at the outer end, lobed and spiny. Flowers in dense, erect racemes or spikes, 5 to 7 inches long. Bracts triangular-acute, conspicuous. Sepals spreading. Petals erect, notched. Fruit globular, the size of a pea, containing four or five seeds attached rather to one side of the base ; stalk slender. **t. 11.** Wight Sp. Nilg. t. 8, Ic. t. 940.

Distinguished from the Himalayan M. nepalensis, *Spr.* by the more globular fruit and more slender pedicels.

On the outskirts of sholas, at high elevations very common. Nilgiris : Ootacamund, Pykara. Pulneys : Kodaikanal downs. Shevaroys doubtfully indigenous.

The arrangements for cross-fertilization appear to be the same in both species and exactly as in the common Barberry of England. Honey is secreted by nectaries at the base of the stamens, and is partially protected from rain by the concave petals in the ordinarily half-drooping position of the flower. The stamens are very sensitive, and when an insect probing the base of the flower for honey touches them the filaments move inwards so that the insect's head or proboscis is touched by the anthers and carries away pollen to another flower. The stigma being large and round cannot fail to receive pollen if the insect visits a flower with the side that is dusted

with pollen inwards. Self-fertilization will occur, if pollination be not previously effected, by the stamens moving in when the flower fades. The flowers are thus adapted to the visits of short-tongued insects (beetles and bees).

NYMPHÆACEÆ.

The Water-Lily family is perhaps too well known to need description. The plants are all perennial rooting in the bottom of slow streams or ponds, with large round or heart-shaped leaves floating on the surface, or less often standing above it. The flowers are borne singly on long stalks, usually above the surface of the water. Sepals 3 to 5, greenish. Petals 3 to 5 white or coloured. Stamens 6 to many, the outer or all filaments sometimes broadened and resembling petals: but anthers small. Carpels many combined into a flat or slightly depressed broad ovary without style, but covered with the many-angled stigma: or in the Sacred Lotus (NELUMPIUM) sunk in a arised fleshy 'torus.'

A family of but few genera, but world-wide, being found in fresh water in all regions.

The stalks of the leaves and flowers are spongy, i.e., full of many large spaces filled only with air. This structure found also in other water plants is held to facilitate the interchange of air, between the living parts and the atmosphere, which is hindered by immersion in water. Like other submerged water plants the surface is slimy, but the upper surface of the leaf has a very smooth tough surface on which water does not readily lodge.

NYMPHÆA.

Only genus here. Characters as in the family. Leaves heart-shaped, floating: the ovary of many carpels combined with a sessile many-angled stigma,

2

Nymphæa stellata *Willd.* ; *F.B.I.* I 114. A Water-Lily with blue flowers and entire or bluntly-sinnate-toothed floating leaves.

Nilgiris : in the Lake possibly introduced from lower levels.

Nymphæa lotus *Linn*, with sharply sinnate-toothed floating leaves is the common red or white water-lily of the plains.

Nelumbium speciosum *Willd.* with round leaves carried often above the water-level and large fragrant flowers is the so-called ' sacred lotus '.

FUMARIACEÆ.

Herbs with usually delicate much divided leaves and the parts of the flower in twos. Sepals 2. Petals 4 in two dissimilar pairs, one or both of the outer pair swollen or spurred at the base, the inner pair smaller and usually coherent at the tips. Stamens 6, in two bundles opposite the outer petals the middle anther 2-celled, the outer 1-celled. Ovary 1-celled, but of 2 carpels ; fruit 1-seeded and indehiscent, or a many-seeded capsule.

Species about 150, in the temperate and warm regions of the N. Hemisphere.

Common European weeds which may at any time appear on these hills are various species of FUMARIA (Fumitory) and CORYDALIS.

Species of DICENTRA (DIELYTRA) especially D. spectabilis are cultivated in gardens.

CORYDALIS. F.B.I. 9 III.

Herbs with the characters given above but one outer only spurred and capsule many-seeded.

Species about 80, mostly in temp. Europe and Asia.

Corydalis lutea *DC.* A small herb of 6 to 15 inches Leaves delicate, much divided into narrowly oblong segments of different lengths. Flower yellow, about $\frac{1}{2}$ inch, in short racemes ; spur a roundish sac. Fruit a pod, $\frac{1}{4}$ to $\frac{1}{3}$ inch long with several seeds.

Nilgiris : as a weed in gardens, etc.

Gen. Dist. Southern Europe, in stony places.

FUMARIA.

Very similar to CORYDALIS but capsule one-seeded.

Fumaria parviflora *Lamk.* *F.B.I.* i 128, IV 1. A pale-green herb. Leaf segments very narrow ; flowers pink about $\frac{1}{4}$ inch long ; fruit pointed even when ripe.

A weed of cultivation on the E. Nilgiris. [*G.F.M.P.*]

CRUCIFERÆ. F.B.I. 10.

One of the largest and most useful families in regions of temperate climate, the CRUCIFERÆ have but few representatives here ; and on the plains of South India none but the cultivated Mustard, Cabbage, Radish and other vegetables.

The chief features of the family are the very regular arrangement of the four petals with their narrow upright stalks and spreading blades ; the six stamens arranged two opposite two sepals, and two pairs of longer ones opposite the other two sepals ; and the two-celled ovary with seeds on the side-walls not in the centre of the partition as in all other two-celled ovaries. The peculiar arrangement of the stamens is because each of the pairs is formed by the splitting of a single rudiment. The flowers are always in racemes without bracts to the pedicels, and the fruit is a dry pod opening by the two sides coming

off and leaving the partition with the seeds often still attached to its edges.

There are usually two honey glands at the feet of the two single and shorter stamens causing them and the corresponding sepals to bulge out a little.

The family is found all over the world, but chiefly round the Mediterranean. Common garden plants are CHEIRANTHUS, Wall-flower, *Ger.* Goldlack, *Fr.* Violier or Giroflée jaune; IBERIS, Candytuft, *Ger.* Baurensenf; MATHIOLA, Stock or Gilly-flower, *Ger.* Leukoje rote, *Fr.* Giroflée.

Species of BRASSICA are cultivated for their seeds (Rape and Mustard), their tuberous roots (Turnip), their edible leaves (Cabbage, Brussels-sprouts, Savoy, Kale), or their much enlarged inflorescence (Cauliflower). The common Watercress, Nasturtium officinale *L.*, is another of the family.

For distinguishing the genera importance is attached to the shape of the pod, whether long and narrow as in the Wall-flower, or broad and thin, and in the latter case whether the partition is across the narrower diameter as in the Shepherd's Purse, or the broader as in Honesty; and further to the relative position of the radicle and the cotyledons in the seed, whether the radicle lies along their edges as in the Wall-flower and Stock, or across them when they are folded over it as in the Cabbage. This distinction can be seen without difficulty in the ripe and dried seed, since there is no endosperm and the seed coat fits tightly over the embryo. When one groove only shows on the surface it is the division between the radicle and the cotyledons (i.e., the radicle lies along their edges), when two grooves are seen they separate the radicle in the centre from the cotyledons which wrap round the other side of it.

Named in allusion to the spreading of the four petals in the form of a cross.

A. Pod long narrow, radicle along the edges of the cotyledons. Flowers white or whitish.

Pod flattened. Seeds in one row . . . . . CARDAMINE.

Lower leaves three-foliate, toothed . . . C. africana.
Lower leaves pinnate or pinnatisect. . . . C. hirsuta.
Pod cylindrical. Seeds in two rows . . . NASTURTIUM.
Ls. pinnate (Watercress). . . . . N. officinale.
B. Pod long and narrow, indented between the seeds and beaked. Radicle across the cotyledons. . . . BRASSICA.
Lower leaves broad, lyrate; upper narrower, finely toothed. Flowers yellow. . Mustard . . . B. juncea.
C. Pod short, as broad or broader than long.
Partition across the narrower diameter. Pod heart-shaped. Shepherd's Purse . . . . . CAPSELLA bursa-pastoris.

CARDAMINE. F.B.I. IO VIII.

Bitter-cress, etc.

Herbs. Leaves usually pinnatisect. Flowers white or purple. Pod narrow, opening by two valves. Seeds in one row only; radicle of embryo along the edges of the cotyledons.

Species about fifty over the whole of the temperate and arctic regions.

Named on account of the use the leaves were once put to as a cure for that form of indigestion which produces palpitation of the heart, from the Greek KARDIA *a heart and* DAMAO *I subdue. Compare the name Cardamon for the spice which has the same property. But the Greek* KARDAMON *was also the common garden Cress.*

To the genus belong the English wild plants, Cookoo-flower, Bitter-cress; the German Gaucheblume, Wiesenkresse, the French Cresson-nette.

Cardamine africana *Linn.*; *F.B.I.* i 137, VIII 3. A small perennial herb with long-stalked, pinnately three-foliate leaves about 1 inch by 1 inch, small white flowers, and slender rather erect pods. Main stem very often ending soon in a raceme of flowers, with leaves and axillary branches continuing on one side. Pods. $1\frac{1}{2}$ by $\frac{1}{20}$ inch. **t. 12.** Wight Sp. Nilg. t. 9, Ic. t. 941 (C. borbonica).

Very common in sholas. In the higher mountains of India and Ceylon.

Gen. Dist. Mountains of tropical Africa and south temperate regions.

Cardamine hirsuta *Linn.* ; *F.B.I.* i 138, *Wall. Cat.* 4781 *! ; not* 4780 ; VIII, 6. Hairy Bitter-cress. An annual herb very variable in size and in the toothing of the stem leaves, hairy or quite glabrous. Leaves mostly radical ; leaflets five to seven, from ovate-cuneate to reniform, almost entire or coarsely three-lobed, terminal one largest ; those of the stem leaves much narrower almost linear. Flowers small, white. Pods slender, $\frac{3}{4}$ by $\frac{1}{30}$ inch, to $1\frac{1}{4}$ by $\frac{1}{20}$ inch, tapering off at the end. Seeds brown, circular. **t. 13.**

Nilgiris : Pykara. Pulneys : on the downs. Very common on the higher hills of South India.

Gen. Dist. All over the temperate parts of India, and in Bengal during the cold weather, and generally in all temperate countries including England.

NASTURTIUM. F.B.I. 10 V.

Similar to CARDAMINE but pods cylindrical not flat, and seeds globose in two rows.

Species 2 or 3, in temperate and tropical countries.

Nasturtium officinale *Br.* ; *F.B.I.* i 133, V 1, Water-cress ; is given in *Gamble's Flora of the Presidency of Madras* i 37, as on the Nilgiris, ' probably introduced '.

BRASSICA. F.B.I. 10 XXIV.

Cabbage, Mustard, etc.

Well-branched biennial or perennial herbs with bluish foliage. Flowers usually yellow in long leafless racemes. Pods long cylindrical, ending in a round beak

and large stigma. Seeds roundish, in one row ; radicle, across the cotyledons which are wrapped round it.

Species about fifty, in the Mediterranean region, central Europe, and central and eastern Asia.

Named from the old Celtic name BRESSIC (*Cabbage*) *or possibly from the Greek* BRAZEIN *to cook.*

Brassica juncea *J. D. Hooker and Thompson ; F.B.I.* i 157, XXIV 6 ; Indian Mustard. An annual growing to 4 feet. Lower leaves elliptic or oblong lanceolate, irregularly toothed, and often with irregular triangular segments on the long and wide stalk ; upper leaves narrower, lanceolate and more regularly toothed. Flowers yellow. Pods 1 inch or more, with a long beak tipped by the stigma. **t. 14.**

Cultivated all over India, and from Egypt to China.

CAPSELLA. F.B.I. 10 XXVIII.

Pod broad and flat with partition across the narrower diameter, heart-shaped ; its halves boat-shaped, keeled, many seeded. Radicle lying across the cotyledons. Small herbs with white flowers and lobed or entire leaves.

Species four, in temperate climates of both hemispheres.

Capsella bursa-pastoris *Medic.* ; *F.B.I.* i 159, XXVIII 1 ; Shepherd's Purse. Lower leaves usually on the ground as a rosette, lobed or deeply cut ; stem leaves few, oblong or lanceolate, clasping the axis by large ear-shaped bases. Flowers, white. Pods with the partition showing down the middle of each side. Seeds oblong. **t. 15.**

A weed of cultivation nearly all the world over except in tropical climates. To be found in flower at all seasons because very quick to mature. At once recognizable by its pod.

Name CAPSELLA, *a little capsule; and* BURSA-PASTORIS *the literal Latin for Shepherd's Purse, an old and universal name.* Ger. *Hirtentasche*; Fr. *Bourse de Berger.*

CORONOPUS (SENEBIERA). F.B.I. 10 XXX.

Annual or biennial prostrate branching herbs with leaf-opposed racemes of small white flowers characterized by the fruit being composed of two globular one-seeded parts.

Species about twelve, mostly in sub-tropical climates.

Coronopus didyma *Linn.* (**Senebiera** *Poir*); XXX 1; Wartcress. A small weed. Leaves $\frac{1}{2}$ to $1\frac{1}{2}$ by $\frac{1}{2}$ inch, deeply pinnatified into narrow leaflet-like segments. Fruit of two globular parts each $\frac{1}{12}$ inch.

A native of tropical America now spread as a weed in many lands. Ootacamund roadsides.

RESEDACEÆ.

A very small family of the temperate parts of the old world.

RESEDA. F.B.I. 12 I.

Herbs with alternate, entire or lobed leaves, and glandular stipules. Sepals and petals 4 to 7, the latter unequal, much cut, and posterior one with a membrane above its stalk. Stamens 10 to 40. Ovary one-celled, with three parietal placentas. Fruit a capsule, opening at the top.

Species about thirty, in North Africa and West Asia.

Reseda luteola *L.*, Mignonette, the common garden plant, is reported as a weed about Ootacamund.

CAPPARIDEÆ.

A small family confined almost entirely to the hotter parts of the world.

CLEOME.

Herbs with simple or digitately compound leaves, and terminal racemes of flowers, like the CRUCIFERÆ with 4 sepals and 4 petals, but with numerous stamens, and the capsule not divided by a partition.

Cleome monoplylla *Linn.; F.B.I.* i 168, I. I. Leaves stalked, lanceolate, horizontal or nearly cordate at base, entire. Flowers pink, about ¾ inch across. Pod cylindrical, narrow up to 4 inches in length.

Shevaroys: Green Hills flower June. Belongs to the plains.

VIOLACEÆ. F.B.I. 13.

A family of twenty-one genera of which the most important is VIOLA.

VIOLA. F.B.I. 13 I.

Violet, Pansy, etc.

Small perennial herbs, with mostly radical leaves and flowers singly on long stalks. Leaves on long stalks, mostly heart-shaped. Sepals five pointed produced backwards at the base. Petals five four of them normal, the fifth and lowest produced backwards as a hollow spur. Stamens five with short broad filaments, large anthers, and small brown flaps surmounting them. Ovary one-celled with three rows of seeds attached to the wall. Fruit is a round or oblong capsule which splits into three boat-shaped pieces, with a row of seeds down the middle of each.

Two of the stamens have thick extensions running back into the spur of the lowest petal, and when these are jogged by the proboscis of a bee or other insect, while it is sucking the honey secreted inside the spur, pollen is shaken out of the anthers, where it had been held in by the flaps, on to the insect's back. When the insect visists another flower of the same species, cross-fertilization is effected. In the common English Dog-violet and Pansy self-pollination is prevented by a flap which closes over the (lateral) stigma as the proboscis is withdrawn, but that does not occur in our species. Pollination would often not take place in wet weather for lack of insects; and to compensate for this there are sometimes other flowers, very much smaller, which do not open at all, but are fertilized by the pollen growing directly out of the anthers on to the stigma (of the same flower).

Species 300 all over the world but mostly in temperate regions and the mountains of the northern hemisphere.

Many are peculiar to the Andes of South America, a few occur in Brazil, South Africa and tropical Africa, eight in Australia and New Zealand, five in the Sandwich Islands.

Named from the old Greek name ION, *for a common European species.*

KEY TO THE SPECIES.

a { Plants of the dry grass land, not connected by runners; leaves much longer than broad . . . . V. patrinii.
Leaves heart-shaped. Plants with runners. . . *b*

b { Shade-loving plants. Hairy. Stigma minute terminal, capsule globose. . . . . V. serpens.
Shade-loving plants. Glabrous. Stigma minute terminal; leaves blunt. . . V. canescens.
Marsh plants. Quite glabrous. Stigma three-lobed. Capsule conical oblong. . . . . V. distans.

Viola patrinii *DC.*; *Wall. Cat.* 1445 !; *F.B.I.* i 183, I 2; the Spear-leafed Violet. Rootstock stout and woody, without runners. Leaves variable, but usually lanceolate, abruptly narrowed at the base, finely but distantly serrate or crenate, glabrous; blade 2 to 3 inches; stalk long and clasping the root-stock at the base. **t. 16.**

Nilgiris, Pulney and Shevaroys : on the open downs, in grass, quite common.

Gen. Dist. Mountains of India, Ceylon, Thibet and over North Asia from Russia to Japan.

Viola serpens *Wallich ; Wight's Kew dist.* 74 *!* ; *F.B.I.* i 184, I 6, our common Wood Violet. All parts hairy, branches and runners very slender and long, rooting occasionally at the nodes. Stipules lanceolate, deeply toothed. Petioles 1 to 3 inches, slender ; blades delicate, hairy, triangular-cordate, apex distinctly drawn out, base with a deep rounded sinus, teeth blunt pointing forward. Normal flowers $\frac{3}{4}$ inch across blue or white sepals $\frac{1}{5}$ by $\frac{1}{20}$ inch : style ending in a hardly visible stigma. Cleistogamic flowers white, $\frac{1}{20}$ inch on peduncles of less than 1 inch. Capsule round, $\frac{1}{4}$ inch. Seed pointed, aril on one side of the top. **t. 17**.

In sholas, on the downs, Nilgiris and Pulneys common.

Viola canescens *Wall. Cat.* 1442 ! ; a closely tufted plant with hardly any stem, and no long runners. Stipules very laciniate, flowers 1 inch across. Leaves as broad or broader than along, not drawn out at apex, glabrows, with very shallow crenatures and drying a darker colour than V. serpens.

Pulneys in woods.

This appears to be indistingüishable from Wallih's V. canescens (Cat. 1442) and to be very close indeed to a V. sylvatica collected in Northern Japan. I consider it, therefore, distinct from V. serpens *Wall.*

Viola distans *Wall. ; F.B.I.* i 183 ; V 5 ; Marsh Violet. Very like V. serpens but grows in wet land in open sunlight, and distinguished by its broader flowers, the lowest petals being small, by a total absence of hairs, except in the throat of the flower, by the broader, obtuse sepals by the stipules without any teeth, and conspicuously

three-veined, by the style at its top three-lobed, the anterior lobe a stigma, and by the capsule much longer than broad and almost conical.

Nilgiris: on the downs in marshes and on banks of streams; flower April (Avalanche), September (Ootacamund), Pulneys: near Poombari.

BIXACEÆ.

Trees with alternate stipulate leaves. Sepals and petals 4 to 6, stamens indefinite, or not. Ovary one-celled.

Species about 200, chiefly tropical.

KEY TO THE GENERA.

Flowers in spikes; petals small, stamens many . . SCOLOPIA.
Flowers axillary; petals $\frac{1}{2}$ inch, each with a scale nearly as long lying in it; stamens as many; fruit large grooved from apex to base . . . . HYDNOCARPUS.

SCOLOPIA. *F.B.I. 14 II.*

A small genus in Asia, Africa and Australia.

Scolopia crenata *Clos.; F.B.I.* i 191, II 3. A medium sized tree. Young branches brown, with rough bark and many small lenticels. Leaves ovate, 4 by 2 inches, the margin indented with shallow and irregular serratures from near the base to the obtuse or short acuminate tip, glabrous on both sides; lateral nerves 6 to 8 pairs. Flowers in axillary simple or compound racemes; pedicels $\frac{1}{4}$ inch. Calyx tube $\frac{1}{2}$ inch narrow tubular, obconic above $\frac{1}{6}$ inch; sepals and petals 5, each about $\frac{1}{8}$ by $\frac{1}{2}$ inch. Stamens numerous, straight, in apparently more than two rows, white; anthers small round. Ovary

glabrous, one-celled in early fruit ovoid ; style thick $\frac{1}{2}$ inch or $\frac{1}{3}$ inch, stigma three-lobed. Ovules numerous, anatropous, erect, from 3 or 4 parietal-placentas. **t. 18.**

Nilgiris : Coonoor, common on Lamb's Rock Road at 6,000 feet. Shevaroys : Green Hills, abundant.

Gen. Dist. Western side of South India.

HYDNOCARPUS. F.B.I. 14 IV.

Almost always a diœcious tree, the male and female flowers on different trees. Petal with a scale lying along it.

Species about six, chiefly Australian.

Hydnocarpus alpina *Wight ; F.B.I.* i 197, IX 3. A tree of the dense shola, with very dark green almost black foliage, and brilliant red young leaves. Branchlets zigzag ; leaves alternate, narrow ovate-acute, with 6 to 8 pairs of veins visible above and the smaller veins distinct below. Flowers few in short axillary spikes. Sepals ovate, nearly equal, or the inner two slightly larger. Petals 5, white, $\frac{3}{4}$ inch by $\frac{1}{8}$ inch, linear, the margins folded to hide the oblong scale which lies against each petal and is about half as long ; this scale has a truncate fimbriate end. Stamens 5 ; filaments short ; anthers $\frac{1}{6}$ inch, curved, not reniform. Male flowers with rudimentary ovary. Female flowers with fully formed stamens, the anthers of which however do not open ; ovary globose, surmounted by the broad, pink, lobed stigma. Berry ovoid, the size of a fair-sized apple, or custard-apple. Wood of no value. **t. 19.**

Nilgiris : Coonoor, etc., on slopes 6,000 feet and under, forming often dense woods of this species alone, e.g., on the Droog.

Gen. Dist. Western Ghauts and Ceylon, in moist valleys.

PITTOSPORACEÆ. F.B.I. 15.

A family of nine genera and ninety species, chefly Australian, of which fifty belong to one genus PITTOSPORUM.

PITTOSPORUM. F.B.I. 15 I.

Sticky-seed.

Trees with alternate simple, entire leaves, small flowers and small orange-coloured fruits. Branchlets characteristically umbelled.

Flowers in umbels or corymbs often close down amogn the young leaves, white or yellowish-green in colour. Calyx small. Petals five, yellowish, oblong. Stamens five. Ovary covered with short erect hairs, and ending in a short stiff style; incompletely two-celled. Fruit a small berry, when young having a turpentiny smell, with short persistent style, and marked on the outside with a vertical equator along which the rind splits open and spreading out flat exposes the red or orange sticky seeds.

Species about 50 in the tropical and subtropical regions of Australia, Asia, Africa, and the Pacific Islands.

Named by Banks from PITTE=*to cover with pitch and* SPOROS=*a seed.*

KEY TO THE SPECIES.

Flowers in panicles, seeds 6 . . . . P. floribundum.

Flowers on short, stout pedicels, umbelled at the ends of the twigs. Seeds 4 .. . . P. tetraspermum.

Flowers on slender pedicels in racemes from among the uppermost leaves, forming a loose corymb. Seeds 5 to 9 P. nilghirense.

Flowers in umbellate racemes . . . . . . P. dasycaulon.

Pittosporum tetraspermum *Wight and Arnott* ; *Herb. Wight No.* 124 *!* ; *F.B.I.* i 198, I 3 ; Cherry Orange, or Common Yellow Sticky-seed. A small tree with thick trunk and grey bark (usually covered with flat encrusting lichens). Twigs thickly studded with yellow pustules (lenticles), usually in bunches of three or four together. Foliage rather thick and dark. Leaves whorled at the ends of the twigs, or at the forkings, elliptic or oblanceolate, quite glabrous, leathery, with slender but on the lower side quite distinct veins ; stalk $\frac{1}{4}$ inch. Pedicels $\frac{1}{6}$ inch lengthening to $\frac{3}{4}$ inch in fruit, stout, umbelled or in short irregular racemes. Sepals small. Petals creamy yellow, curved backwards. Stamens stiff, half the length of the petals. Style $\frac{1}{16}$ inch ; stigma capitate. Fruit $\frac{1}{2}$ inch round, in colour and shape much as an orange when ripe. Seeds three or four, imbedded in orange-coloured sticky flesh, which smells strongly of turpentine. **t. 20.**

In and at the edges of sholas, quite common on Nilgiris and Pulneys. Flowers December-March. Fruit summer.

Gen. Dist. Western Ghauts, Shevaroys, Anamalais and Ceylon only.

Pittosporum nilghirense *Wight and Arnott ; Herb. Wight No.* 141 *! ; F.B.I.* i 198, I 4. Very similar to the last in general habit. Leaves obovate 1 to 2 inches. Flowers in loose racemes of 1 to 3 inches, with slender pedicels of $\frac{1}{2}$ to 1 inch terminating the twigs or in the uppermost leaf-axils. Fruit $\frac{1}{4}$ inch, often solitary on the peduncle. Seeds 5 to 9.

Nilgiris : Kotagiri, Sispara, Ootacamund. Pulneys : at lower levels.

Gen. Dist. Western Ghauts, Nilgiris, Pulney and Anamalais.

Pittosporum floribundum *Wight ; F.B.I.* i 199, I 6. Racemes of flowers branched. Fruit $\frac{1}{5}$ inch with six small seeds.

On the Kodaikanal Ghat below Shembaganur, flowering profusely in the autumn and then very conspicuous.

Gen. Dist. From Mahendragiri (Ganjam) southwards, 4,000 to 5,000 feet.

Pittosporum dasycaulon *Mig. F.B.I.* i 199, I 7. Not unlike P. floribundum, but the inflorescence much less dense, its branches densely hairy. Flowers white; anthers bright yellow; capsule large, compressed, and densely tomentose.

Shevaroys: 'Green Hills'; flower, June.

Gen. Dist. Western Ghauts above 3,000 feet southwards.

POLYGALACEÆ. F.B.I. 16.

A family of ten genera and about 700 species, occurring all over the world but only rarely in the Arctic regions, Polynesia and New Zealand. POLYGALA is the chief genus.

POLYGALA. F.B.I. 16 I.

Milkwort.

Flower in general appearance very like that of the Pea, there being a pair of spreading wings (the two inner and lateral sepals) and a keel (the lower petal); but at once distinguished from that family by a fringe at the tip of the keel, and in essential details quite distinct. Sepals five, of which three are small. Petals three only, the anterior one boat or keel-shaped fringed at top. Stamens eight, united together at the base and to the keel: anthers free, opening by pores at the ends. Ovary two-celled. Fruit a flat oval capsule, winged slightly along the edges except at the top, where is a notch. Seeds one

only in each cell pendulous, large and with a branched appendage (aril) which in the different species varies in size and form. Trees, shrubs or herbs, with simple alternate leaves and no stipules.

Species about 450, in all the temperate and warmer parts of the world.

There is a bract and two bracteoles below the flower, and in some species the latter disappear before the flower opens, in others they persist. In some species also the two larger *wing* sepals are green (*herbaceous*), in others coloured (*petaloid*). The aril of the seed may be very large and red, covering nearly the whole seed, or more usually white, and then with two or three outgrowths (*arms*) spreading down over the seed, or without any. These characteristics are therefore to be observed for the determination of a species.

Pollination is brought about in much the same way as with the Papilionaceæ. The anthers shed their pollen into the keel and it is pushed out when an insect alights to suck honey from the base of the flower and depresses the keel by its weight. The species differ in details.

KEY TO THE SPECIES.

Flowers bright yellow, $\frac{3}{4}$ inch ; seeds with large red aril and a black circular disk ; shrub. . . . . P. arillata.

Flowers mauve or pink, $\frac{1}{2}$ inch, in short racemes from the axils of the upper leaves ; rootstock woody, stems slender spreading on the ground Common Milkwort . P. sibirica.

Wings yellow, keel pink ; leaves oblanceolate. . P. javana.

Flowers solitary in the leaf-axils ; annual, erect or spreading, with narrow leaves . . . . P. rosmarinifolia.

Polygala arillata *Hamilton*, *Wall. Cat*, 4191 *c* and *d ! ; F.B.I.* i 200, I 1 ; Red-eye or Yellow Milkwort. Shrub 3 to 12 feet with loosely growing branches covered with light coloured bark. Leaves up to 6 by 3 inches, elliptic or oblong-lanceolate, accuminate or not entire, glabrous, dark dull-green. Flowers in drooping racemes

from the upper leaf-axils, yellow, $\frac{1}{2}$ to $\frac{3}{4}$ inch across : bracteoles deciduous. Sepals unequal ; upper very concave ; lateral (wings) oblong, spreading, greenish-yellow, very conspicuous ; two lower small. Petals yellow. Capsule almost heart-shaped when ripe, straw-coloured, and opening on each side. Seeds in two pairs, about three-quarters covered by three large red fleshy outgrowths which rise from the base and leave a rounded area at the top : this area a jet black circular patch with a slaty-blue zone round, like the pupil and iris of an eye in a red fleshy setting. **t. 21.**

The seed remains some considerable time attached to the dried capsule, which does not fall from the bush. See note on Ternstrœmia japonica *Thumb.*, p. 53.

Nilgiris ; in sholar frequent. Pulneys : from Shembaganur upwards. Flowers, June ; fruit from September.

Gen. Dist. Hills of South India—Western Ghauts, Bababoodums, Coorg, Anamalais, etc. Ceylon from 4,000 feet.

Not elsewhere. Nepal and Khasi plants have the flowers in branched racemes, and have been separated by Chodat as P. tricholopha. In the F.B.I. the wings are given (? Nepal and Khasi) as red-purple, but in our plant they are a clear lemon yellow.

Polygala javana *DC. ; F.B.I.* i 201, I 3. At these levels a small loosely branched under-shrub : Leaves obovate or oblanceolate, slightly wedge shaped, $\frac{3}{4}$ to 2 inches, with one strong vein. Racemes longer. Wings conspicuous, broadly ovate, yellow. Keel with large pink fringe. Capsule globose enclosed in the now larger wings.

Shevaroys : Green Hills flowering June.

Gen. Dist. At lower levels—Deccan, etc.

Polygala rosmarinifolia *Wight and Arnott ; F.B.I.* 204, I 13 ; Rosemary Milkwort. An erect or spreading well-branched annual, 2 to 18 inches high. Stem very

slender throughout, but rigid, pubescent. Leaves $\frac{1}{2}$ to 1 by $\frac{1}{8}$ to $\frac{1}{6}$ inch, narrow linear, erect on the branches, with thickened and recurved margins and strong midrib ; but not coriaceous or with the hard apex of P. sibirica. Flowers greenish, solitary or in short racemes in the leaf-axils, erect, $\frac{1}{8}$ to $\frac{1}{6}$ inch long. Bracteoles persistent minute at the base of the pedicel and close against the equally small bract or the subtending leaf. Wings obliquely ovate. Petals rounded ; Pod elliptic, with a narrow purple margin. Seeds two, black, covered with short hairs of and capped by a large white aril with two short extensions round the scar. **t. 22.**

Pulneys : upwards from Shembaganur 5,500 feet. Shevaroys : in Yercaud.

From Northern Circars and Vizagapatam southwards.

Polygala sibirica *Linn.*, var. *heyneana* (not *Wallich* 4184 *!*) ; *F.B.I.* i 205, I 14 ; Common Milkwort. A small plant with numerous stems, $\frac{1}{16}$ inch or less in thickness and four to many inches long, trailing on the ground from a thick perennial rootstock. Leaves nearly sessile, $\frac{1}{3}$ to 1 inch long and usually not more than $\frac{1}{6}$ inch wide, elliptic or oblong, with recurved margins and only one strong vein (midrib) ending in a short recurved point ; but when dry marked on the upper side with a fine raised network quite characteristic in containing no straight veins. Flowers in short erect racemes, or occasionally solitary, in the upper leaf-axils ; pinkish-mauve or purple. Bracteoles minute, deciduous before the flower opens. Outer sepals $\frac{1}{8}$ inch inner (wings) $\frac{1}{4}$ by $\frac{1}{6}$ inch, acute, and very slightly oblique. Lateral petals broadly obovate or triangular, joined at the base, usually spreading out horizontally, very conspicuous : keel

shorter or longer, with conspicuous fringe. Style longer, with conspicuously large spoon-shaped and incurved violet end which arches over the anthers. Capsule $\frac{1}{4}$ by $\frac{1}{5}$ inch flat, surrounded except at the middle of the top by a wing $\frac{1}{20}$ inch wide. Seeds two, black; capped by a small white aril which bears a tuft of hair at the top and three flat oblong white appendages, with rather broader fringed ends, reaching two-thirds down the seed. t. 23.

From the type species the plant which occurs here differs in the stouter midrib, more recurved margins, oblong leaves, and larger appendages.

In the grass of the open downs, very common from 5,500 feet upwards, often trailing over the edges of cattle tracts: flowering after the early rains. Occasionally with white flowers.

Gen. Dist. Himalayas from Kashmir to the Khasi Hills, and beyond to Siberia, China and Japan. In Ceylon, on the highest mountains, as a larger form. Not on the Western Ghauts to the north of the Nilgiris.

Pollen is shed from the anthers and collects in the hallowed side of the style, and is presented to insects which alight on the flower and depress the keel.

CARYOPHYLLACEÆ.

This is the family of our garden Pink, Carnation, Gypsophila and Chickweed. Its members are all herbs, with sessile simple leaves and conspicuously swollen nodes. The flowers are usually terminal on the branches; sometimes in very regular cymes, as in the common pink Catch-fly of our gardens (SAPONARIA). The sepals may be united or free; the petals are always free, and five; the stamens usually twice as many. But the character which distinguishes the family from all others except the PRIMULACEÆ and MYRSINEÆ (and they are very different in every other respect), is the one-celled fruit

with its large, round, central placenta, on which the, usually numerous, seeds are arranged. The seed is deeply indented at the scar, being bent round so that the apex lies near the base ; and the embryo inside is in consequence bent round too. This curving of the embryo is also characteristic of the family, and of a few others for that reason considered allied to it.

The family is a large one of 80 genera and 1,300 species, and belongs chiefly to the temperate regions. In India it is practically confined to the Punjab and temperate Himalayas, and to small mountain areas like the Nilgiris and Pulneys. On the plains of Southern India only two species occur wild.

Named from two Greek words KARION *a nut, and* PHYLLUM *a leaf, because the buds consist of ordinary unexpanded and rather long leaves, not short specialized scales, and takes the form of rather hard leafy lumps at the ends of the branches.*

KEY TO THE GENERA.

a	Sepals united as a tubular calyx ; flowers pink. . .	*b*
	Sepals not united ; flowers white	*c*
b	Styles 2, flowers in dichotonous cymes . .	SAPONARIA.
	Styles 3, flowers in axils of leaves	SILENE.
c	Leaves four or many at a node with thin stipules . .	*d*
	Leaves two only at a node without stipules	*e*
d	Leaves 1 inch or so, narrow ; petals 4 . . .	SPERGULA.
	Leaves four only at a node, flowers $\frac{1}{8}$ inch ; sepals keeled ; petals 5	POLYCARPON.
	Leaves 4—6 ; flowers silvery.	POLYCARPÆA.
e	Lower leaves stalked ; petals deeply divided ; capsule not much longer than broad.	STELLARIA.
	Leaves all sub-sessile ; petals entire : otherwise similar to the above.	ARENARIA.
	All leaves sessile ; petals notched ; capsule two or three times as long as broad, glistening. . .	CERASTIUM.
	Leaves narrow, petals minute	SAGINA.

SAPONARIA.

A genus not wild here, but cultivated in gardens, from which one species is found sometimes as an escape.

Named from the soapy nature of its leaves when bruised.

Saponaria vaccaria *Linn.*; an annual herb with regularly decussate ovate sessile stem-lasping leaves and terminal corymbs of pink flowers, in regularly-forking cymes.

A common garden plant which occurs occasionally as an escape.

SILENE. F.B.I. 18 VI.

Campion, Catch-fly.

Calyx tubular (inflated or not), five-toothed, ten-nerved. Petals five, with narrow lower part and spreading upper, often with two swellings at the middle. Ovary often slightly stalked: capsule of firm material, three to five locular at the base, one locular at the top, opening in six teeth. Seeds kidney-shaped covered with transverse rows of tubercles on the back and sides.

Annual or perennial herbs with solitary, cymose, or variously panicled flowers.

Species 300, chiefly round the Mediterranean region. *Ger.* Pechnelke, *Fr.* Attrapemouche.

Named after the drunken, slobbering god SILENE, *because some of the species are covered with sticky secretion.*

Silene gallica *Linn.*; *F.B.I.*, i 218, VI 3. A loose straggling herb with opposite leaves, but the flowers developed only along one side of the stems thus forming unilateral racemes. Stem or branches erect or ascending, 4 to 18 inches. Leaves oblong or oblanceolate

about 1 by $\frac{1}{8}$ inch, sometimes sticky. Flowers nearly sessile in the axils of one of each pair of upper leaves. Calyx tube $\frac{1}{3}$ to $\frac{1}{2}$ inch, with long and shorter glandular hairs, ten-ribbed. Petals not much exserted from the tube, pink, each with two erect scales at the throat. Styles three. Capsule egg-shaped. Seed with rows of tubercles, and an ear-shaped depression on each side. **t. 24.**

As a weed by roadsides, etc.

Gen. Dist. A weed of cultivation in all parts of the world, native of Europe.

CERASTIUM. F.B.I. 18 X.

Chickweed.

Named from the Greek KERAS, a horn, because of the comparatively long and curved capsule, its most distinguishing characteristic. Pubescent and sticky weak-stemmed herbs with broad sessile leaves and small white flowers in terminal cymose panicles, and having the sepals free. Not unlike STELLARIA but for the long pod, which opens by short teeth.

Species 100 distributed over the northern termperate regions and on tropical mountains, but absent from Australia (except the common garden Chickweed, C. vulgatum *L.*)

KEY TO THE SPECIES.

Capsule $\frac{1}{4}$ inch, or less; flowers few, the branches of the panicle bifurcating; leaves pointed . . . C. indicum.
Capsule $\frac{3}{8}$ inch or more; branches of panicle constantly branching into three; leaves blunt . . . . C. vulgatum.

Cerastium indicum *Wight and Arnott ; Wight Herb. No.* 149 *!* ; *F.B.I.* i 227, X 3. Stems very slender. Leaves lanceolate or elliptic, acute, $1\frac{1}{4}$ by $\frac{3}{8}$ inch, smaller towards

the top, and reduced to small scales under the branches of the inflorescence. Flowers few, in dichotomous cymes with widely spreading pedicels. Capsules not much longer than the sepals ; teeth turned back. **t. 25.**

In sholas on the Nilgiri and Pulney Hills, but not on the Bombay Ghauts.

Cerastium glomeratum *Thuillier* ; *F.B.I.* i 228, X 4 as C. vulgatum *Linn.* ; Common or Mouse-ear Chickweed. A coarsely hairly, more or less sticky herb, typically annual but occasionally perennial, very variable in habit. Ground leaves narrow and stalked, stem leaves sessile, broadly ovate to narrow oblong. Flowers in an almost perfect close three-chotomous panicle. Sepals $\frac{3}{16}$ inch with conspicuous scarious margins. Petals shorter, sometimes absent. Stamens often reduced to five or fewer. Capsule projecting far out of the calyx, slightly bent and opening at the top in ten small straight teeth, very smooth and glistening when ripe. **t. 26.**

A garden weed, found now all over the world, wherever it is not too hot. *Fr.* Morgeline, *Ger.* Hornkraut.

STELLARIA. F.B.I. 18 XI.

Stitchwort, Chickweed.

Flowers similar to CERASTIUM, except that the petals are divided nearly to the base, the styles three only, or if five then alternative with the sepals, and capsule globose, opening in as many valves. Herbs with opposite exstipulate leaves, and flowers in cymose panicles.

Species about 100 in temperate regions and tropical mountains, many cosmopolitan. *Ger.* Wasserstern.

Named beacuse of the star-like flowers.

KEY TO THE SPECIES.

a	Plants with tomentum of stellate hairs . .	S. saxatilis
	Hairs simple	*b*
b	Flowers in long-peduncled cymose panicles; seed one only	S. paniculata.
	Flowers axillary; seeds many in the capsule .	S. media.

Stellaria paniculata *Edgew; F.B.I.* i 229, XI 2. Stem 2 feet. Leaves 1 to 2 inches, variable in shape. Flowers small. Young ovary three-celled, but when ripe with only one wrinkled seed.

Nilgiris; 6,000 to 8,000 feet.

Gen. Dist. Temperate Himalayas, Kashmir and Khasia.

Stellaria media *Linn.*; *F.B.I.* i 230, XI 5; Chickweed or Starwort. A common weed with weak stem and small white star-shaped flowers.

Stem weak, much branched, flaccid, green and marked with two opposite lines of fine white hairs. Lower leaves with slender stalks, $\frac{1}{2}$ inch or more, ovate, acute, glabrous, quite entire; upper leaves sessile. Flowers in the axils of the upper leaves, or in irregularly forked leafy cymes. Sepals $\frac{1}{8}$ inch. Stamens ten to five. Styles free, capsule ovoid, projecting beyond the sepals, seeds brown, covered with sharp tubercles. Wight Ic. t. 947.

In sholas and as a weed, Nilgiris, Pulney, Shevaroys.

Gen. Dist. All through the temperate regions of India and Ceylon and over the arctic and north temperate regions.

Stellaria saxatilis *Ham*; *F.B.I.* i 232, XI 14. Stem 2 to 3 feet, decumbent below, densely tomentose above. Flowers in umbel-like cymes, with very slender pedicels of 1 to $1\frac{1}{2}$ inches. Petals $\frac{1}{8}$ inch, two-partite. Capsule 5-valved. Seeds tubercled.

Nilgiris, as a weed.

Gen. Dist. Temperate Eastern and Central Himalayas, Khasia and across to Java, Siberia and Japan.

ARENARIA. F.B.I. 18 XIII.

Sandwort.

Like STELLARIA but the petals not divided or notched; styles not divided; capsule opening by the same or double the number of valves as styles.

Species 100, almost all over the world, more especially in the temperate and cold regions.

Name from the Latin ARENA = *sand.*

Arenaria neelgherrensis *Wight and Arnott, Herb. Wight* 148 *!*; *F.B.I.* i 239, XIII 14; Nilgiri Sandwort. Stem and its numerous branches slender, with a line of pubescence down one side. Internodes $\frac{1}{4}$ to $\frac{1}{2}$ inch. Leaves $\frac{1}{5}$ to $\frac{1}{3}$ inch, ovate, one-nerved, hardly acute. Flowers on slender pedicels of 1 inch, in the axils of the upper leaves or in leafy cymes. Sepals $\frac{1}{8}$ inch long and broad, ovate-acute, with a single hairy nerve and thin scarious edges.

Nilgiris: Ootacamund and Dodabetta (Gough !) and below.

Very close to A. serpyllifolia *L.* of Europe, but in habit much laxer, leaves less acute, inflorescence less distinctly cymose, and sepals with only one nerve and that pubescent. A. serpyllifolia *L.*; *F.B.I.* i 239, XIII 14; may also occur in a lax form as an introduced weed. It has more pointed leaves, more distinct cymes, and the sepals and bracts with three or five veins.

SAGINA. F.B.I. 18 XIV.

Herbs with very narrow leaves connate at the base, but without stipules. Sepals free. Petals not notched, usually minute. Stamens 4 or 5, or 8 to 10. Styles 4 or 5 opposite the sepals, and also to the valves of the capsule.

Species about 10, in temperate regions.

Name from the Latin SAGINA *= fatness because supposed good herbage for sheep.*

Sagina procumbens *L.; F.B.I.* i 242, IV 1. A perennial herb, 1 to 6 inches with procumbent branches forming a tuft. Leaves subulate, bright green. Flowers solitary on very slender axillary pedicels, $\frac{1}{8}$ inch. Sepals usually 4. Petals smaller, 4 or more.

Nilgiris: above 6,000 feet as a weed. (*G.F.M.P.*)

Gen. Dist. Throughout Europe and in North America, Australia.

SPERGULA. F.B.I. 18 XVI.

Spurry.

Annual herbs with narrow leaves and small scarious stipules. Sepals free; petals entire; styles five, alternate with the sepals; capsule opening by five valves opposite the sepals.

Species two or three only in temperate climates; a weed of cultivation. *Eng.* Spurry. *Fr.* Spergule. *Ger.* Spark, Spergel.

Named from the Latin SPARGO *= I scatter because the seeds are well scattered.*

Spergula arvensis *Linn.; F.B.I.* i 243, XVI 1; Corn Spurry. An annual with dense false whorls of long linear leaves at the base of which are small scarious stipules, and small white flowers in regular three-chotomous cymes, white. Stems 6 to 12 inches, pubescent or glandular, green, simple or forked. Leaves, half-cylindrical, grooved beneath, in bunches at the nodes because of the development of those of the axillary buds. Stipules small scarious. Petals shorter than the sepals. Stamens ten or five. Capsule subglobose, longer than the sepals. Seeds black, slightly flattened and with a narrow scarious border. **t. 27.**

A weed of cultivated ground on these hills.

Not recorded in C.B.F. on the ghauts to the north, but in Scind and on the Kirthar mountains.

Gen. Dist. Cosmopolitan in temperate climates.

POLYCARPON. F.B.I. 18 XVIII.

Diffuse herbs with flat, often falsely whorled, leaves and small flowers in much branched cymose panicles. Bracts scarious; sepals with scarious edges and coloured green or red keels; petals small hyaline; stamens three to five; style short, three-fid; capsule opening by three valves.

Species about 6, over temperate and tropical regions.

Polycarpon tetraphyllum; *F.B.I.* i 245, XVIII 1. A perennial with weak angular branches spreading on the ground in a flat circular patch 6 to 12 inches across. Leaves of a whorl unequal, from $\frac{1}{4}$ to $\frac{3}{4}$ inch, obovate-cuneate. The whole plant sometimes red, leaves and keels of sepals red. Cymes terminal or in the forks dense or not. Flowers $\frac{1}{8}$ inch diameter. **t. 28.**

Ootacamund in waste ground. Flowering after the first spring rains. Also all over the plains of this Presidency.

Gen. Dist. Tropics of Asia and Africa.

POLYCARPÆA. F.B.I. 18 XIX.

Similar to POLYCARPON but sepals not keeled; style three toothed only; and whole flower silvery white.

A small genus of perhaps 30 species, in warm climates.

Polycarpæa corymbosa *Lamk.*; *F.B.I.* i 245, XIXI. Stems thin hairy. Leaves narrow, often fascicled in the axils. Stipules fimbriate. Flowers $\frac{1}{8}$ to $\frac{1}{6}$ inch, in dense silvery terminal corymbs.

Nilgiris : Kaity valley. Belongs properly to much lower levels.

ELATINACEÆ.

ELATINE. F.B.I. 21 I.

Very small and tender herbs, creeping on mud, with opposite or whorled leaves and very small flowers, usually one to each node, pedicelled or sessile, of 2 to 4 sepals, petals and stamens, and a 3 to 5 celled ovary with as many styles.

Elatine americana *Arn.* ; *F.B.I.* i 250, I 1. On mud in patches of 1 to 3 inches diameter, rooting at the nodes. Ends of branches ultimately ascending. Leaves $\frac{1}{8}$ to $\frac{1}{3}$ inch ovate, lanceolate, entire, narrowed to the base. Flowers $\frac{1}{12}$ inch diameter. Sepals 3. Petals 3. Seeds curved, about 12.

Nilgiris. (*G.F.M.P.*)

HYPERICINEÆ.

A small family of 8 genera and some 200 species, of which 160 belong to the genus HYPERICUM distributed in temperate climates of the northern hemisphere.

HYPERICUM. F.B.I. 22 II.

St. John's Wort.

This is perhaps the easiest of all genera to recognize, for the bright yellow flowers have numerous stiff straight stamens in bunches alternating with the petals, and the leaves contain oilglands which against the light show as translucent dots or streaks.

The only plants which have similar oilglands have either alternate leaves (RUTACEÆ and MYRSINEÆ) or inferior ovaries (MYRTACEÆ).

Plants mostly small, either herbs or shrubs, never trees ; leaves opposite, sessile, entire. Flowers typically in cymes of three (the middle one opening first and terminating the axis) ; but also solitary or panicled. Quite regular. Sepals five. Petals five, yellow, overlapping each other in bud and twisted. Stamens numerous, united into one, three, or five groups, alternating with glands. Ovary superior with a corresponding number of cells and of styles. Fruit a capsule which splits open into its constituent cells (not down the back of each one as with so many capsules), leaving the placentas attached to the central axis or the edges of the valves.

Species 160, in temperate climates. England has about 10, St. John's Wort, or Tutsan ; *Ger.* Johanniskraut.

KEY TO THE SPECIES.

a
- Shrubs. Stamens in five groups ; styles five . . . . *b*
- Herb. Stamens in 3 groups ; ovary 3-celled. . . . H. humifusum.
- Herbs. Ovary 1-celled . . . . *c*.

b
- Branches stiff ; leaves decussate ; styles slender longer than the ovary. (Common) . . . H. mysorense.
- Branches drooping, the bush round-topped ; leaves bifarious ; styles stout, shorter than the ovary . . . (Rare) . . . . H. Hookerianum.

c
- Bracts and sepals fringed with long-stalked glands ; seeds dotted, but not ribbed . . . . H. Wightianum.
- Bracts and all parts devoid of stalked glands, but fringed with small dots just inside the margin ; seeds ribbed... H. japonicum.

Hypericum mysorense *Heyne*, *Wall. Cat.* 4808 ! ; *F.B.I.* i 253, II 2 ; common St. John's Wort. A shrub, 3 to 8 feet high ; twigs four-angled, green or reddish. Leaves stiffly decussate, sessile, narrow elliptic lanceolate

with strong midrib. Flowers at the ends of the branches solitary or in threes, of a rich yellow colour, 3 to 4 inches across, mostly facing upwards. Sepals lanceolate $\frac{1}{2}$ inch by $\frac{1}{8}$ inch. Petals obovate-oblong, limp and flat when fully out and therefore widely separated, reddish on the back of the parts exposed in bud. Stamens slender and very numerous, in five bundles: anthers globular, $\frac{1}{50}$ inch. Ovary five-celled, with five styles longer than itself. Fruit a rich crimson colour, egg-shaped, pointed; surmounted by the five styles. **t. 29.** Wight Ic. t. 56.

The commonest species and abundant everywhere on the Nilgiri downs, more especially on poor soil, on the borders of the plateau as near Kotagiri, Aval anche and Pykara, where it covers whole hill-sides to the exclusion of every other shrub.

Gen. Dist. On the hills generally of South India and Ceylon, but rare in the Bombay Presidency and not reported from elsewhere in India.

Hypericum Hookerianum *Wight and Arnott; Herb. Wight Prop!; F.B.I.* i 254, II 6. A shrub with weak spreading, not erect, branches. Leaves ovate—lanceolate, set bifarious, i.e., in two rows all facing upwards, not decussate. Flowers pale yellow and saucer-shaped, the petals not separating widely as in H. mysorense. Fruit ovid on a thick base $\frac{3}{4}$ inch. Styles thick shorter than the ovary. **t. 30.** Weight Ic. t. 949.

The two plants are totally different in habit and general appearance.

Nilgiris: near streams (gorge opposite Bangitappal). Rare. Pulneys: Seen by me only in the garden of the Observatory (lower house). Not common.

Gen. Dist. Himalayas, Khasia.

Hypericum Wightianum *Wall. Cat.* 4010*!; F.B.I.* i 256 *incl. in H. nepaulense;* II 15*. A weak spreading herb with smooth round stems up to 15 inches long. Leaves ovate $\frac{1}{3}$ to $\frac{3}{4}$ inch, all except the uppermost devoid

of stalked glands. Bracts and sepals with slender teeth tipped by black or red glands and with long pellucid veins. Some of the uppermost leaves also with a few gland tipped teeth near the base, but for the most part the leaves entire and with round pellucid dots and also when dried large black dots on the under-side. Anthers tipped by round black glands. Styles three, free, about $\frac{1}{8}$ inch, with conspicuous round red stigmas. Ovary one-celled, the seeds attached to the outer wall in three rows, round and dotted, not ribbed. **t. 31.** Wight Ill. t. 43.

Very common in moist places, both Nilgiris and Pulneys, above 5,000 feet.

H. nepaulense *Choisy* occurs on the higher slopes of the Himalayas from Sikkim to Kashmir. It has a two-edged stem, short teeth only on the sepals, and a three-celled ovary.

Hypericum japonicum *Thumb.*; *F.B.I.* i 256, II 17; Marsh St. John's Wort. A very delicate herb, growing, in marshy and damp places, in tufts a few inches high; stems straight, up to 8 inches; branched or not, four-angled. Leaves $\frac{1}{2}$ inch or less, oval or ovate, quite entire, clasping the stem at the base; midrib strong, veins two to four from the base, very slender; glands in the leaf as round pellucid dots. Flowers at the ends of the main stem and its branches, in comparatively large loose cymes; bracts and sepals quite entire, without any stalked glands. Flower $\frac{1}{4}$ inch diameter pale yellow. Stamens all free or all equally united, not in bundles. Ovary one-celled, with three parietal placentas and three very short ($\frac{1}{20}$ inch) styles. Capsule $\frac{1}{6}$ inch, red. Seeds flat short oblong, with about seven longitudinal ribs and numerous transverse striations. **t. 32.**

Very common in moist places or shallow standing water. Nilgiris: all over both sides. Pulneys: on the downs. Shevaroys: near Yercaud.

Gen. Dist. Anamalais, Ganjam, Poonachi hills but on the Ghauts to the north rare, and recorded in C.B.F. from Castlerock, S.M. country, only. Widely distributed in eastern temperate climates, Himalayas, Khasi hills, Assam, Burma, and on to China, Japan, Australia and New Zealand.

Var. **major** *Fyson.* A trailing weak-stemmed plant, about twice the size in every detail of H. japonicum, with no intermediate formes, much less branched, the flowers terminal and in the upper axils only. It differs from H. humifusum, with which I suspect that it has been confused, in its one-celled ovary; and from H. Wightianum, which it resembles in size and habit, in its absolutely entire sepals and bracts.

Nilgiris: on western downs. Rare. Flower June.

Hypericum humifusum *L.; F.B.I.* i 255, II 13. Similar in habit to H. wightianum (Vol. II t. 31) but the sepals unequal and with black glands inside the margin, and no gland-tipped teeth or stalked glands; and the ovary completely divided into three chambers.

Nilgiris: (*G.F.M.P.*). I have not seen this plant.

Gen. Dist. Europe, Atlantic Islands and South Africa.

GUTTIFERÆ.

Trees with opposite leathery leaves and yellow or greenish juice. Flowers hermaphrodite or unisexual with the sexes on the same or on different trees. Sepals and petals 2 to 6. Stamens numerous, round a rudimentary ovary. Ovary in the female or hermaphrodite flowers of 2 to 12 cells, surrounded by a ring of staminodes. Fruit usually a berry with large seeds.

Species about 300, in the tropics.

The mangosteen, Garcinia Mangostemma, is cultivated in the Berliyar gardens (half-way down the Mettupalaiyam Ghaut from Ootacamund). The fruit of Garcinia morella yields Gamboge.

GARCINIA. F.B.I. 23 I.

Trees with the characters given above and distinguished further by the stigma being sessile on the ovary, without style ; the seeds solitary in each cell of the ovary ; and the fruit a large berry with thick rind, and in our species scored with five deep grooves up to the stigma.

Species about 60 in tropical Asia, Africa and Polynesia.

Garcinia Cambogia *Desrouss ; F.B.I.* i 261, I 6 as **var. 2.** A tree with dark green rather thick oval leaves, and sessile flowers remarkable for the thick concave yellow sepals and erect thick, reddish petals. Leaves elliptic with or without a short acumen, quite entire, coriaceous dark green, acute at the base with numerous faint parallel side-nerves. Male flowers nearly sessile, in 3-merous, terminal sessile cymes : sepals and petals 4 ; buds large, the outer sepals bright yellow thick, the inner larger and greener ; petals reddish, $\frac{1}{2}$ by $\frac{1}{3}$ inch ; stamens 20 or 30 in a square mass with often no pistillode, anthers opening by parallel slits, on shorter, thick filaments. Female or hermaphrodite with deeply lobed stigma, sessile on the ovary. Fruit ovoid, $1\frac{1}{2}$ by 2 inches, deeply grooved from the base to near the top where the stigma persists. Seeds large, usually 2 or 3 only. **t. 33.** *Tam.* Kodakkapuli. *Mal.* Kodapuli, Pinaru.

Nilgiris : Coonoor and Kodanad, etc., in the jungles of the slopes and on roadsides, 6,000 feet.

G. morella is distinguished by its anthers which open by a horizontal circular slit. G. mangostama has much larger flowers and its stamens in four masses.

TERNSTRŒMIACEÆ.

Tribes—TERNSTRŒMIACEÆ and GORDONIEÆ.

Woody plants with alternate, thick or hard leaves; flowers solitary on their stalks; sepals 5, imbricate and progressively larger, rather hard and often brown; petals 5, imbricate and lightly attached to each other at the base; stamens numerous, sometimes attached to the base of the petals; ovary three to five-celled, with a single style. Rather characteristic of the family are the hard, comparatively large, buds.

A family of some 240 species, common in the tropics of Asia and America, but very rare in Africa; absent from Australia, and practically so from all temperate climates.

Economically the most important member is the Tea-plant, Camellia theifera *Griff* a native of Assam and China. Another species of the same genus, C. japonçia *L.*, is cultivated in European gardens, for its rose-like but scentless flowers.

KEY TO THE GENERA.

a { Flowers small, white very numerous on the older and leafless parts of the small branches . . . . . EURYA.
Flowers $\frac{3}{4}$ or 1 inch across, few, yellow or cream . . . *b*

b { Leaves entire; seeds with soft, warty, red covering; a large tree . . . . TERNSTRŒMIA.
Leaves serrate; seeds winged; tree . . . . . GORDONIA.

TERNSTRŒMIA. F.B.I. 24 II.

Evergreen trees or shrubs. Leaves firm and leathery; entire or serrate. Petals connected at the base. Stamens many; anthers glabrous, fixed firmly on the ends of their filaments. Ovary of two or three cells, each with two pendent seeds, style simple. Fruit indehiscent, seeds few, pendent from the top of each cell. Embryo bent, with very short half-cylindrical cotyledons.

Species 28, mostly in tropical America; but about six in the warmer parts of Asia and the Indian archipelago.

Named by Linnæus in honour of a Swede, C. TERNSTRŒM, *who as a naturalist travelled over China in* 1745.

Ternstrœmia japonica *Thunbergh ; F.B.I.* i 280, II 1. A very fine, shady tree, growing in the open to 40 feet or more, with straight stem and hemispherical crown of foliage ; bark smooth and wrinkled ; branches rather crowded, and swollen at the point of attachment. Leaves crowded near the ends of the branches : stalks $\frac{1}{4}$ inch, red, thick : blades $2\frac{1}{4}$ by $1\frac{1}{4}$, oblong-obovate, entire, thick, glabrous. Flowers from the axils of the fallen leaves, fragrant : stalks 1 inch, erect in bud, afterwards bent down : bracteoles two, close under the sepals and hardly distinguishable from them. Petals spreading $\frac{3}{4}$ inch, pale yellow, stiff and easily crushed. Anthers opening at the side, and ending in minute points. Ovary two or three-celled : fruit $\frac{3}{4}$ inch, clasped at the base by the enlarged sepals and the two small bracteoles, and peaked at the top by the persistent style ; smooth like an apple, with pericarp $\frac{1}{8}$ inch thick. Seeds four, hanging for some time after the pericarp has opened ; covered with a scarlet soft and deeply papillate outer skin ; inside this stony : endosperm very hard ; embryo inside almost S-shaped, the radicle pointing upwards. Wood reddish brown, smooth. **t. 34.**

Nilgiris : in sholas, 6,000 to 7,000 feet. Avalanche, Pykara below Kodanad, Coonoor, etc., quite common. Not found on the Kodaikanal downs.

Gen. Dist. Not at all on the Ghauts to the north (Bombay Presidency) ; but on the Khasi hills and southwards to Moulmein, and on to Sumatra, China and Japan. I am unable to distinguish the variety *Wightii* of the F.B.I.

In foliage this tree with its erect red-stalked oval leaves is very like Symplocos obtusa, the leaves being only slightly smaller, and slightly more erect.

The length of time these highly coloured seeds hang in the opened fruit, while most seeds fall quickly to the ground, is significant, and clearly a very useful adaptation for dispersal by birds, which are attracted by the high colour, are rewarded by a little soft flesh to eat, but are prevented from damaging the embryo by the stony endosperm and smooth skin. The flowers are adapted for pollen-seeking bees, which are attracted by the scent and the yellow colour.

EURYA. F.B.I. 24 VI.

Usually shrubs. Flowers unisexual, on separate plants (diœcious); sepals imbricate. Petals connected at the base. Stamens many, attached to the base of the corolla; anthers firmly fixed on their filaments; ovary three-celled, with many ovules; styles three; fruit a berry. Seeds many, attached to the middle of the placentas; embryo as in TERNSTRŒMIA.

Species about 50 in Mexico, South America, West Indies and East Indies.

Named, it is said, from the Greek EURUS *broad, because of the broad leaves, but this is hardly applicable to our species.*

Eurya japonica *Thunbergh*, var. *nitida*, *Korths*; *F.B.I.* i 284, VI 1. Most often, as near Ootacamund, a shrub barely 10 feet high, but in the sholas of the Pulney downs also as a tall tree, overtopping all others. Its most distinguishing characteristic is the arrangement of the quite small flowers or berries on the lower, and leafless, 3 to 5 inches of short lateral branches which are leafy at the ends. Twigs very slender, much indented by the scars of the fallen leaves, and soon covered with grey or whitish bark. Leaf-stalks $\frac{1}{4}$ inch; blades 1 to 2 inches elliptic or

oblanceolate, shortly acuminate, closely serrated except on the lower third, hard and shiny glabrous. Flowers white in little groups of two or three, shortly stalked in the axils of the fallen leaves ; less than $\frac{1}{4}$ inch across when fully open. Fruit a black berry, $\frac{1}{5}$ inch diameter with a minute three-fid style in the centre of a depression at the top, and sitting in the remains of the dried sepals. Seeds $\frac{1}{20}$ inch, light brown, flat ; embryo inside curved. **t. 35.**

The F.B.I. gives three varieties, two of them as occurring here. But I have seen only this one. It has smaller leaves than the type.

Very common in sholas on both plateaus, as a shrub by small streams, e.g., at Andy's Corner, Governor's Shola Road, Ootacamund ; also in sholas as a tree, even a very large tree.

Gen. Dist. Mountains of India, Ceylon, Burma and the Malay archipelago to China, Japan, Fiji, etc.

GORDONIA. F.B.I. 24 XII.

Anthers lightly attached to their filaments ; fruit a loculicidal capsule ; seeds with a wing at the top. Trees with evergreen entire or crenate leaves and often beautiful flowers. Petals lightly connected at the base ; the inner larger. Stamens many. Ovary three to five-celled, with many pendent ovules ; style simple. Seeds without endosperm ; embryo straight.

Species about 16, mostly in India, Malaya and South China ; also in North America.

Named in honour of GORDON, *a horticulturist.*

Gordonia obtusa *Wallich, Cat.* 1459 *! ; F.B.I.* i 291, XII 2. A moderate sized, evergreen tree, with rather erect and not widely spreading branches, which end in large silky buds. Leaves 2 to 4 inches elliptic, crenate, acute at both ends, firm and smooth ; stalk $\frac{1}{3}$ inch ; midrib strong. Flowers lateral on the branches, solitary

in the leaf-axils, 1 to 2 inches diameter, very handsome, white or creamy, with bright yellow centre of numerous stamens ; very similar to those of Tea. Sepals silky on the back ; outer smaller. Petals thin, distinctly connected at the base, from which spring the stamens, and falling off as a whole corolla bearing the stamens. Ovary five-celled ; style single ; fruit a five-angled, woody capsule, 1 inch long, furrowed at the top, and opening loculicidally and the valves (carpels) separating from the persistent axis to which the ten seeds are attached. Flowers May to December. **t. 36**. Wood reddish, hard. *Vern*. Nagetta.

Fairly common, especially near water.

Nilgiris : Ootacamund in the swamp below Havelock road ; in sholas on the downs ; Pykara ; Coonoor. Flowers May. Pulneys : on the downs in sholas ; Silver cascade.

Gen. Dist. Permade, Anamalais, Travancore and on the Bombay Ghauts to the north, but not elsewhere in India.

MALVACEÆ.

Mallow, Hollyhock, etc.

This family is distinguished from all others chiefly by the very numerous anthers being of one *cell* (two pollen sacs) only instead of two, and attached by short stalks to a staminal tube which stands up round the style in the centre of the flower.

The plants are as a rule more or less covered with both simple and stellate hairs ; have a fibrous and slimy inner bark ; alternate simple, stipulate leaves, and showy flowers borne solitary in the leaf-axils. The flowers have five petals twisted over each other in bud ; numerous stamens united as above mentioned in one tube, or in definite bundles ; and a three to five-celled ovary with

single branched style and capitate stigmas. The fruit is always dry, either a capsule or breaking up into separate seed-containing sections.

The family is mainly a tropical one, and abundant on the plains, where various species of HIBISCUS are cultivated, either for the fibre of the inner bark (Hemp) or the edible fruit (Bandikai) or as garden flowers. On these hill-tops only two genera appear to be indigenous.

Well-known members of the family are HIBISCUS ALTHÆA Hollyhock, GOSSYPIUM Cotton-plant, ERIODENDRON and BOMBAX Silk-cotton trees, THESPESIA, planted on the Madras beach.

The name MALVA (Eng. *Mallow*, Ger. *Malve*, Fr. *Mauve*) *was adopted by Linnæus from the Greek* MALAKEE, *soft in allusion to the sliminess of the plant when crushed.* HIBISCUS *was the Greek name for our Mallow.*

KEY TO THE GENERA.

a	Fruit a capsule	*b*
	Fruit separating into its constituent carpels	*c*
b	Tall herb or shrub with entire or lobed leaves	*d*
	Low herb with roundish, cut leaves	MODIOLA.
c	Styles as many as the carpels, i.e., 5	SIDA.
	Styles twice as many, i.e., 10	URENA.
d	Capsule opening in 5 valves	HIBISCUS.
	Capsule in 10 valves	DECACHISTA.

MALVA. F.B.I. 26 III.

Mallow.

Downy herbs with lobed leaves and axillary clusters of flowers, each with three free bracteoles and characterized further by having in each carpel one ascending ovule and by the carpels separating from each other in fruit.

Species under 20, in temperate regions of the Old World, some widely distributed as weeds.

Malva verticellata *Linn.* ; *F.B.I.* i 320, III 1 ; Mallow. Stem branched 2 to 4 feet. Leaf-stalk 2 to 7 inches : blade as long and nearly as broad, with five large lobes, and crenate margin. Flowers nearly sessile in dense clusters at the nodes. Petals notched, slightly longer than the sepals. Carpels ten to twelve, enclosed within the calyx, accrescent, netted at the sides, prominently ribbed at the back.

Nilgiris : Kotagiri ; a weed.

Gen. Dist. Europe to Abyssinia and China. Himalayas. Nilgiris.

MODIOLA. 26 IV *

A small herbaceous plant distinguished by its fruit separating into carpels each with two seeds separated by a horizontal partition ; epicalyx of three bracteoles.

One species only, a native of North and South America but found also in South Africa.

Closely allied to ABUTILON, and the fruit in general appearance so like one of that genus that it may easily be mistaken for it ; but the carpels in ABUTILON are not divided by a horizontal partition.

Modiola caroliniana *Linn.* ; IV * 1. A small herb with green prostrate stems and branches matted close to the ground, and covered with numerous large stellate hairs or nearly glabrous. Leaf-stalks $\frac{1}{2}$ to $1\frac{1}{2}$ inches ; blades roundish deeply cut into large and small lobes recalling those of Ranunculus diffusus, nearly glabrous. Flowers, solitary in the leaf-axils ; stalk jointed one-third from the top, hairy like the branches. Epicalyx of three lanceolate, acute ; bracteoles with hairs along the veins. Petals pink, $\frac{1}{8}$ inch, hardly longer than the sepals. Fruit $\frac{1}{3}$ inch across, black, very hairy, breaking into its constituent carpels (about twenty) : these with two hair-tipped points at the outermost corner and a deep rounded

bay in the middle of the inner edge where they are attached to the centre, and opening by a slit at the top. Seeds glabrous. **t. 37.**

Ootacamund, covering the bank of the stream between the bazaar and the Gymkhana ground. Kotagiri: bazaar stream; Kodanad T. E.

SIDA. F.B.I. 26 IV.

Herbs or undershrubs with toothed leaves, and linear stipules. All green parts pubescent with simple or stellate hairs. Flowers of the family type, but the fruit splitting into five carpels, which may or may not have each two awns at the top. Radicle in the seed pointing upwards.

KEY TO THE SPECIES.

Leaves glabrous . . . . S. acuta.
Leaves hairy; pedicel jointed about the middle; carpels awned. S. rhombifolia.
Pedicel jointed at the base; carpels hardly awned. . . . . S. rhomboidea.

Sida rhomboidea *Roxb.*; *F.B.I.* i 324 as *var.* rhomboidea of S. rhombifolia *Masters.* A wayside weed, 1 to 2 feet, leaves 1 to 2 inches, ovate, toothed in the distal half, entire and more or less cuneate in the nearer. Flower stalks longer than the short petioles, jointed at the base. Flowers pale yellow. Carpels 6 to 10, with very short or no awns. **t. 38.**

Nilgiris: Coonoor, on waysides.

Sida acuta *Burm.*; *F.B.I.* i 323, as part of S. carpinifolia *Linn. f.*

Leaves lanceolate or ovate, or oblong; serrate, glabrous; stalk of flower about equal to the petiole.

A common roadside weed: Shevaroys and at all low elevations.

Sida rhombifolia *Masters.* ; *F.B.I.* i 323 (in part). Similar to the first, but stalk of flower jointed about the middle, and carpels in fruit awned.

A common weed : Shevaroys, and at all low elevations.

URENA. F.B.I. 26 VI.

Similar in habit to SIDA but the flowers with an epicalyx of 5 bracteoles attached to the calyx, and the styles twice as many as the carpels. Ripe carpels covered with hooked bristles. Radicle in the seed pointing downwards.

Species very few, in tropical countries.

Urena lobata *Linn.* ; *F.B.I.* i 329, VII. An undershrub with slender branches covered as are all green parts with stellate hairs. Leaves deeply lobed, palmately or pinnately, the middle lobe in the lower leaves much the largest, and with shallow serrations all round the margin ; dark green above, lighter below. Flowers solitary or two or three of unequal ages in the leaf-axils. Calyx of ten parts, five outer green bracteoles, five inner lighter and thinner sepals. Corolla 1 inch diameter, pink with darker centre, usually turned down or to the back, and more so with age. Staminal tube cylindrical, with only a few scattered anthers attached near the upper end, which is entire not toothed. Stigmatic arms 10, capping the staminal tube. Ovary five-celled. Fruit of 5, one-seeded parts, thickly covered with hooked bristles **t. 39.**

Nilgiris : Coonoor and at lower levels. Shevaroys : in and around Yercaud.

Gen. Dist. Throughout the hotter parts of India, and in the tropics generally.

HIBISCUS. F.B.I. 26 XII.

Fruit is a capsule of five cells, which open loculicidally (i.e., down their backs, the cells not separating from one another); and below the calyx a whorl of three or more bracteoles (these in our species might be mistaken for sepals). Herbs or woody plants, their young parts covered usually with stellate or with simple hairs. Staminal column continuing in five-pointed teeth above the insertion of the topmost filaments. Ovary of five cells, each with three, or usually more, ovules. Style divided above into five branches with round velvetty stigmas. Seeds kidney-shaped.

Species about 150, nearly all in the tropics. In Europe only two and in England none.

Common Indian plants of this genus are H. rosa-sinensis the ornamental Shoo-flower in its many varieties, H. esculentus (Bendekai), H. sabdariffa (Roselle), H. cannabinus (Deccan hemp).

HIBISCOS *was the Greek name for the Marsh Mallow, now known as* Althœa officinale, *a near ally of the Hollyhock; and this name is said to have been derived from* IBIS *the Egyptian goddess.*

Hibiscus angulosus *Masters, Wight Herb. No.* 202 !; *F.B.I.* i 341, XII 27; the Hill Mallow. A tall coarse herb, clothed in all the younger parts with long straight hairs which hide the short stellate ones with which the whole plant is covered. Leaf-stalks variable, from ½ to 5 inches; blades 2 to 4 inches across, deeply or shallowly five-lobed, the lobes acute and irregularly toothed. Flower-stalks in the axils of the upper leaves, longer than the petoles; bracteoles three, large and leaf-like, meeting round the base of the flower. Calyx white, thin, in the form of a tube split down one side. Corolla

when fully open up to four inches across. Capsule 1 to 1½ inches, pointed, splitting open in five acute, hairy valves. **t. 40.** Wight Ic. 951.

By the edges of sholas ; flowering in the colder months, September to January. Nilgiris : Ootacamund to Kotagiri, Kodanad and below. Pulneys : on the downs quite common. Shevaroys.

Gen. Dist. South India and Ceylon on the higher mountains. Not on the Ghauts to the north (C.B.F.).

It is perhaps worth noticing that the duty of protecting the petals and inner parts of the flower, ordinarily left to the sepals, is here undertaken by the large bracteoles, and that the calyx has degenerated to a thin tube, while the petals are thickened at the top where they are exposed.

DECACHISTA.

Tomontose shrubs with entire or lobed or toothed leaves and solitary or clustered flowers, similar to those of HIBISCUS but distinguished by the carpels (cells of ovary) styles and valves of capsule being ten. Bracteoles ten, narrow, oblong.

Decachista crotonifolia *W. & A.* ; *F.B.I.* i 332. Flowers 4 inches diameter, pale yellow.

Shevaroys : near Yercaud.

Gen. Dist. Mysore plateau, Deccan, Nilgiri and Pulneys up to 2,500 feet.

TILIACEÆ.

Of this rather varied family of trees, shrubs and herbs, with alternate leaves, small flowers in cymes, numerous stamens situate on a central torus, with long anthers opening by lateral slits, and an ovary often also on a central stalk, we have only two generas—TRIUMFETTA,

a herb or undershrub distinguished by its globular fruits covered with anchoring spines, and GREWIA many tree species of which grow close below our area.

The family is mainly a tropical one, TILIA, the Lime tree of England, *Fr.* Tilleul, *Ger.* Linden, being almost the only genus occurring north or south of the 30° line of latitude. It is also pre-eminently Indian, some of the genera and many of the species being found only in this country.

Economically the most important species is the Jute or Gunny-plant, CORCHORUS CAPSULARIS, the fibre of which is obtained from the bark. The Linden, TILIA EUROPEA, is also a source of fibre (the *bast* of gardeners), and ropes used to be made of this in various parts of England, and also in olden days a rough kind of paper.

The name TILIA *is said to have been derived from the Greek* PTILON, *a wing, because of the long bract attached to the flower-stalk.*

TRIUMFETTA. F.B.I. 28 IX.

Herbs or shrubs with alternate leaves and all green parts covered with stellate hairs. Flowers yellow, with five sepals and petals, ten or more stamens springing from a fleshy lobed and distinctly raised torus, and a 2 to 5 celled ovary with filiform style. Fruit a round capsule covered with long spines.

Species about 60, tropical weeds.

Triumfetta pilosa *Roth.; F.B.I.* i 394, IX 2. A herb covered with bristles on bulbous bases. Leaves hairy on both sides, the lower three-lobed, the upper ovate of ovate-lanceolate, unequally toothed, about 4 by 2½ inches, with petiole ¾ inch and subulate stipules. Flowers ¾ inch, yellow. Fruit including the spines, 1 inch diameter; four-celled, with two seeds in each cell.

Nilgiris: Coonoor at 6,000 feet, on roadsides.

GREWIA. F.B.I. 28 VI.

Trees with alternate leaves, which have as a rule several veins springing from the end of the stalk, and

axillary fascicles of yellow flowers, in which the sepals are free, the petals glandular at the base, the stamens spring from the apex of a raised torus, without staminodes, and the ovary, its cells opposite to the petals, with one or two seeds in each, becomes a small drupe.

A genus of the warmer parts of the world. Many of the species difficult to define and to distinguish.

Grewia tiliæfolia. *Vahl.*; *F.B.I.* i 386, VI 11. A moderate sized tree. Leaves 2 to 5 inches long and broad, slightly cordate at the base, roundish but more or less angular and finely toothed. Flower beds tomentose: sepals about $\frac{1}{4}$ inch. Petals, $\frac{1}{2}$ inch, yellow. Peduncle of cyme shorter than the stalk of the subtending leaf. Fruit $\frac{1}{4}$ inch glabrous.

Nilgiris: Lovedale (P. V. Mayuranathan)—belongs properly to lower levels.

Other species of this genus which may be found (*G.F.M.P.*) on the borders of our area are—

Grewia obtusa *Wall.*; *F.B.I.* included in G. bracteata *Roth.* i 389, VI 21. A shrub with lanceolate, serrate, 3-veined leaves 3 to 4 by $1\frac{1}{2}$ to $1\frac{3}{4}$ inches; flowers on axillary peduncles which are shorter than the leaf-stalks; and large, not lobed; fruits, an inch in diameter. Nilgiris on the eastern slopes.

Grewia heterotricha *Masters*; *F.B.I.* i 385 VI 6. A climbing shrub with elliptic acuminate 3-veined leaves 4 by 2 inches covered with stellate hairs; peduncles opposite the leaves and twice as long as the petioles, 3-flowered, flowers 1 inch diameter, yellow, with the ovary raised a torus of nearly $\frac{1}{2}$ inch, and 4-lobed fruit. Nilgiris on the eastern and northern slopes.

Grewia Gamblei *J. R. Drummond.* Similar to the above but stalk of ovary $\frac{1}{4}$ inch only; leaves and twigs softly tomentose.

Nilgiris: Northern and western slopes.

Grewia Barberi *J. R. Drummond.* Leaves narrow, lanceolate acuminate, sharply serrate glabrous. Peduncles about twice as long as the petioles, and fruit 2-lobed.

Nilgiris: Northern and eastern slopes.

ELÆOCARPACEÆ.

ELÆOCARPUS. F.B.I. 28 XIII.

Only genus.

Trees with simple alternate leaves, and lateral spikes of perfectly regular flowers, consisting of five sepals valvate in bud, five petals with conspicuous fringe at the ends, numerous stamens standing in a raised centre with long anthers opening by pores at the top, and an ovary of several (a variable number of) cells topped by a single style and ripening into a fleshy fruit with one or more stones.

The family differs from the TILIACEÆ, with which the genus was formerly united, in the absence of mucilage (slime) in bark and leaves, and in its anthers.

Species about 50, mostly in or near India, a few only in Australia, New Zealand and the Pacific.

Named from the Greek ELAIS *oil and* CARPON *fruit.*

KEY TO THE SPECIES.

a { Anthers equal at end; leaves flat, oval, serrate, turning bright crimson . . . . E. oblongus.
Anthers with one side prolonged . . . . *b*

b { Leaves round-backed, like an inverted boat, and rusty; anthers with a long projection . . . E. ferrugineus.
Leaves flat, margin waved . . . . E. Munroii.

Elæocarpus oblongus *Gærtner; F.B.I.* i. 403, XIII 13; the Nilgiri Mock-olive. Stem white, well branched, with domed foliage; twigs with conspicuous lenticels as yellowish pustules. Leaves 4 to 6 inches by 2 inches, elliptic, acute or acuminate, glabrous and shining above, crenate-serrate with gland-tipped teeth almost or quite to the acute base; petiole also with two minute glands near the top. Racemes 2 to 6 inches long, in the axils of the upper or the fallen leaves, slender; pedicels $\frac{1}{3}$ to $\frac{1}{2}$ inch; sepals $\frac{1}{6}$ inch, acute, finely pubescent—all these red. Petals white, $\frac{1}{5}$ inch wedge-shaped, with cuts extending from the end half-way down forming a fringe. Stamens on a raised torus $\frac{1}{20}$ inch high, very numerous; anthers $\frac{1}{8}$ inch gaping at the end, not produced beyond, not hairy at the tips. Ovary $\frac{1}{20}$ inch covered with short erect hairs; style twice as long, tapering to a point. Fruit an olive-like drupe, 1 by $\frac{1}{2}$ inch. **t. 41.** Vern. *Tam.* Bikki; *Mal.* Katta kara.

In the axils of the main veins, on the underside of the leaves, one nearly always finds small perforated swellings. These though probably the result of insect agency occur too consistently to be left out of a description. The crimson colouring of the autumn foliage is very striking; one nearly always finds a few leaves turned, and a tree may be identified by them. When a whole tree is crimson, the effect is comparable to that of the "Virginia-creeper."

Quite common towards the lower limit of our areas, often planted near villages. Coonoor, Kotagiri, etc., 6,000 feet; flowering May.

Distributed to the north in the evergreen forests of Kanara, and Mahabaleshwar; westwards to Burma and the Malay islands, but not on the intervening plains. Confined to the semi-temperate hill-tracts of the tropics of Asia.

Elæocarpus ferrugineus *Wight, Herb. Prop.! ; F.B.I.* i 406, XIII 27. A shola tree with greyish or brownish green foliage in well-marked tiers easily recognizable

at a distance, and more closely by its absolutely characteristic round-backed leaves. All young parts and leaves covered with a dense, rusty or greyish tomentum of short stellate hairs; leaf-scars flat; lenticels small; petiole 1 inch. Leaf very convex, like an inverted boat without its keel, elliptic, shortly acuminate, with very shallow serrations $\frac{1}{16}$ to $\frac{1}{8}$ inch apart and tipped with short hairs; densely cinnamom tomentose on the lower side; veins about nine pairs, very regular and repeatedly bifurcating towards the margin. Racemes 2 to 4 inches, pedicels $\frac{3}{4}$ inch; buds elliptic, $\frac{1}{3}$ inch. Sepals $\frac{1}{2}$ by $\frac{1}{6}$ inch, all densely tomentose. Petals as long, $\frac{1}{8}$ inch wide, covered with long appressed hairs fringed with cuts from the margin about one-third down. Stamens twenty or so, on a low yellow torus; anthers $\frac{1}{6}$ inch, one lobe prolonged at the end into a slender curved awn or bristle, the other much shorter. Ovary densely covered with hairs, three-celled. Fruit oval $\frac{3}{4}$ by $\frac{1}{5}$ inch, fleshy, green, with one stone containing a cell with one matured seed and dried-up undeveloped ovules, and two other squashed and aborted cells. Endosperm thick, horny, smelling and tasting strongly of cocoa. **t. 42.**

The leaves turn red, but fall very soon after, so that this colouring is not conspicuous as with E. oblongus.

In sholas only, very common at high levels, especially on the Pulney downs, where there is hardly a shola without several trees. Nilgiris: on the Western plateau, from Dodabetta to Avalanche, Mukarte, etc.

Not on lower levels and absent entirely from the Bombay Ghauts to the north. Apparently confined to these South Indian hill-tops.

Elæocarpus Munroii *Masters; F.B.I.* i 407, XIII 32. A tree. Leaves long-stalked, drooping, glabrous with wavy margin, broadly ovate acute, about 4 by 3 inches.

Flowers facing downwards, in short erect racemes above the terminal tufts of leaves, white and very prominent: anthers with long bristle. Drupe about $\frac{3}{4}$ by $\frac{1}{2}$ inch, smaller than in the other two species. **t. 43.** Vern. *Tam.* Narebikki; *Mal.* Pungari.

Nilgiris: Coonoor, very common and conspicuous in the early summer months.

LINACEÆ.

Tribe I.

Small herbs or shrubs with alternate simple leaves, and racemes of regular and symmetrical flowers on the four or five plan. Petals usually twisted in bud, soon falling. Stamens as many. Carpels dehiscing septicidally.

LINUM. F.B.I. 29. I.

Flax, etc.

Flowers usually blue, but here yellow, with five sepals imbricate in bud, five petals twisted in bud, five fertile stamens, five minute staminodes, five glands outside the stamens (all these alternately with each other) and a five-celled ovary which ripens to a capsule, breaking into 5 two-seeded or 10 one-seeded parts. Seeds oily. Leaves quite entire, narrow.

Species about 90, mostly round the Mediterranean.

Named from LINUM, *Latin for thread cotton or flax. The root* LIN *is one of the oldest root words known.*

Flax, the fibre which is spun and woven into linen, is obtained from the outer part of the stems of Linum usitatissimum which has blue flowers.

Linum mysorense *Heyne; Wall. Cat.* 1507*!; F.B.I.* i 411, II 4. An annual herb with slender stem 3 to 16 inches high, unbranched till near the flowering region,

where it forms broad corymbs; stem glabrous, striate, $\frac{1}{16}$ inch or less in thickness. Leaves sessile, narrow elliptic or oblanceolate, entire, three-veined from the base. Branches of the corymb very slender; flowers opposite the leaf-like green bracts. Outermost sepals herbaceous with narrow scarious margin, entire; inner very thin. Petals yellow, twice as long as the sepals, rounded. Anthers broadly oval. Styles connate below. Capsule opening in ten valves. Seeds oval, flat $\frac{1}{20}$ by $\frac{1}{30}$ inch. **t. 44.**

Nilgiris: Lovedale. Shevaroys.

Gen. Dist. Deccan and Western Ghauts, Himalayas, Ceylon.

Tribe II.

ERYTHROXYLON. F.B.I. 29 VI.

Shrubs with alternate leaves, and small axillary flowers. Petals imbricate (not twisted), each with a scale on the inner face. Stamens twice as many. Stigma 3, fruit a drupe.

Erythroxylon monogynum *Roxb.*; *F.B.I.* i 414, VI 1. Leaves obovate, wedge-shaped at base, entire; midrib conspicuous, but remaining net-work without distinct primary veins.

Gen. Dist. Shevaroys: on green Hills, flowering June. In dry hill forests.

The wood is hard, reddish brown and useful for turning [*G.F.M.P.*]

GERANIACEÆ.

This family as defined in the Gen. Plant. and F.B.I. (i 426) comprises, in India, three tribes: the GERANIEÆ (Crane's bill), the OXALIDEÆ (Wood-sorrel), and the

BALSAMINEÆ (Touch-me-not). These tribes are by some systematists considered distinct families, and are for convenience treated separately here.

GERANIEÆ.

The most distinguishing characteristic of this tribe is the stout beak (Crane's bill) which forms in the centre of the flower as the seeds ripen and from which the carpels split off, each with a slender beak which by a quick curling upwards jerks the solitary seed out (GERANIUM), or by its hygroscopic twistings and untwistings buries it and its seed in the ground (ERODIUM). The parts of the flower are in perfect systems of five: five sepals, five petals twisted in bud, with small round glands between them, ten or fifteen stamens, and five carpels in the ovary. They are usually showy.

The tribe occurs in all parts of the world, but not on the plains of South India; and is represented here by only one truly wild species, Geranium nepalense *Sw.*, but Erodium and a strongly scented Pelargonium, a native of South Africa, occur as garden-escapes.

KEY TO THE GENERA.

a { Leaves palmately cut or lobed . . . . *b*
{ Leaves pinnate. Carpels indehiscent . . . ERODIUM.

b { Flowers solitary or in pairs, on slender pedicels; carpels opening to jerk out the seed . . . . . . GERANIUM.
{ Flowers in umbels, flower-stalk with a slight swelling on one side near the base . . . . PELARGONIUM.

GERANIUM. F.B.I. 32 III.

Crane's bill.

Herbs with opposite or alternate stipulate, toothed or palmately cut, leaves, at swollen nodes; and flowers

solitary or in pairs on axillary peduncles. Seed one to each ripe carpel, jerked out of it by the curling of the "beak."

Species 260 in temperate climates. *Ger.* Storkhschnabel; *Fr.* Bec-de-grue.

Named from the Greek GERANOS, *a Crane,* in allusion to the beak of the ripe fruit.

Geranium nepalense *Sweet; F.B.I.* i 430, III 9; Nepal Crane's bill. A delicate perennial herb with pink stem and flowers. Roots stout; stems slender, weak, much branched, hairy. Leaves opposite, stalks slender, $1\frac{1}{2}$ to 3 inches, densely hairy near the top; stipules $\frac{1}{6}$ inch, very acute; blade deeply divided into five lobes which are again cut and lobed, the ultimate lobes oblong mucronate; surface thinly hairy above, below much more so, and whitish; margin often red. Flowers in pairs or solitary on slender peduncles. Sepals $\frac{1}{4}$ inch, with three coarsely hairy nerves, strongly mucronate. Petals $\frac{3}{8}$ inch, pink or mauve. Carpels hairy; seeds smooth, shining. **t. 45.** Wight Ill. i. t. 59.

Fairly common in grass near sholas on high elevations, but not lower down or on the ghauts to the north.

Gen. Dist. Kashmir, Himalayas 3,000 to 10,000 feet, and Khasia hills, and on the higher peaks of Ceylon, Indo-China.

ERODIUM. F.B.I. 32 IV.

Stork's bill or Heron's bill.

Similar to GERANIUM but carpels not opening, the seed remaining in the carpel and buried by the twisting of the beak.

Species 60, mostly round the Mediterranean, a few also in South Africa, temperate America, and south-west Australia.

Named from the Greek ERODIOS, *a Heron, to distinguish from* GERANIUM *with which the species used to be linked.*

Erodium cicutarium *Leman ; F.B.I.* i 434, IV 1. Similar in habit to E. moschatum but the leaflets more deeply toothed or pinnatifid.

A garden escape, naturalized on the Nilgiris [*G.F.M.P.*].

Erodium moschatum *L'Heritier ;* IV 6. Branches stout ; leaves alternate or opposite, pinnate ; stipules large, $\frac{1}{4}$ inch scarious, those of the unopened leaves as bud-scales ; leaflets obliquely ovate, sharply toothed. Flowers umbelled on long peduncles ; bracts like the stipules ; pedicels $\frac{1}{2}$ inch. Sepals $\frac{1}{5}$ to $\frac{1}{2}$ inch, five-ribbed, pubescent. Tails of carpels 1 to 2 inches, with a few long, yellow permanent bristles below, and many much shorter hairs above, not woolly ; when dry much twisted. **t. 46.**

A roadside plant of the Mediterranean region, and spread from it over northern Europe, the Cape, North and South America and Australia. This appears to be the first record of it on these hills ; probably a garden-escape.

PELARGONIUM. 32 IV.*

The Garden " Geranium."

Stamens two to seven only fertile, the rest sterile ; flower-stalk with a long tubular cavity inside, ending in a slight enlargement near the base (really the spur of one of the sepals fused to the pedicel) ; no glands ; seed remaining inside the carpel as in ERODIUM.

Species 230, practically all in South Africa, six only outside (Australia, Asia Minor, Abyssinia).

Named from the Greek PELARGOS, *a Stork.*

Pelargonium glossularioides *DC.* IV * 1. A very strongly scented plant, with lobed roundish soft leaves and pink flowers is found near habitations as a garden-escape especially on dry soil.

Native of South Africa.

OXALIDEÆ.

As in the Geranieæ the flowers are on a very regular five plan, and the petals are twisted in bud ; but the fruit is a capsule, not separating into one-seeded parts but opening down the backs of the carpels ; the leaves are compound, and there are no glands between the petals.

KEY TO THE GENERA.

Leaflets three or four, attached together to the end of the petiole (Wood-sorrel, "Capebulb," etc.) . . OXALIS.
Leaflets many, pinnately arranged . . . . . BIOPHYTUM.

OXALIS. F.B.I. 32 V.

Wood-sorrel.

Herbs, some bulbous, with acid-tasting three or four foliate leaves, and umbels of flowers on long peduncles ; fruit a narrow capsule which splits open in five lines, the side curling back but remaining attached to the central axis.

About 300 species, chiefly in South Africa, but also in tropical South America. A few in Europe, Asia, tropical Africa and North America. Several have been introduced as garden plants, and because of the difficulty of eradicating the bulbs some have become very troublesome weeds.

The name is an old Greek one, from OXUS, *sharp, and* ALS, *salt, in allusion to the taste of the leaves.*

The leaflets fold inwards and downwards at night, showing as marked a sleep movement as occurs in the family LEGUMINOSÆ. Charles Darwin found that if such movement was prevented the leaves suffered (perhaps from excessive radiation of heat to the sky, i.e., from cold), and thus demonstrated the usefulness, to the plant, of this habit. The stamens and styles are often of three different lengths, some plants of a species having short styles and five medium and five long stamens, others with medium styles and short and long stamens, others with long styles and short and

medium stamens. Charles Darwin showed by experiment that this was connected with the cross-fertilization of the seeds by insects, pollen from long anthers producing on the long styled ovaries (necessarily of different plants) better results than on short styled flowers (possibly on the same plant).

KEY TO THE SPECIES.

a { No stem above ground, leaves and flower-stalks from a bulb . . . . *d*
Stem above ground bearing leaves and flowers, creeping and erect . . . . *b*

b { Flowers solitary, $1\frac{1}{2}$ inches, limb red and tube yellow. Leaflets $\frac{1}{2}$ to 1 inch with apex rounded. O. variabilis var. rubra.
Flowers yellow, in few flowered simple or compound umbels. Leaflets notched at apex . . . . *c*

c { Leaflets $\frac{1}{4}$ to $\frac{1}{2}$ inch green; flowers $\frac{1}{2}$ inch pale yellow; stem creeping slender, yellowish . . O. corniculata.
Leaflets $\frac{1}{2}$ to 1 inch blotched with dark markings; stem purplish creeping and erect . . . . O. pubescens.

d { Leaflets, wedge-shaped deeply notched at apex . . . . *e*
Leaflets four, rounded or acute at apex . O. tetraphylla.

e { Flowers, blue or violet or purple. Leaflets 1 inch . . . O. latifolia.
Flower lemon-yellow. Leaflets $\frac{1}{2}$ inch . . O. pes-capræ.
Flower pale pink. Leaflets 1 inch; bulb $\frac{1}{4}$ inch . . . O. corymbosa.

Oxalis corniculata *Linn.*; *F.B.I.* i 436, V 1; Yellow Wood-sorrel. A small herb with slender stems running horizontally on the ground. Leaf-stalks 1 to 3 inches slender; stipules pale and hairy, adnate to them; leaflets three, obcordate. Peduncles slender, ending in a single flower, or an umbel; pedicels $\frac{3}{4}$ inch, in the axils of linear $\frac{1}{8}$ inch long bracts. Flowers pale yellow, $\frac{1}{4}$ to $\frac{1}{2}$ inch across; petals obovate or notched; fruit 1 by $\frac{1}{8}$ inch, tapering and contracted suddenly at the top, many seeded. Seeds flesh coloured, transversely ribbed. **t. 47.**

A common weed in grass occurring at all elevations upwards from sea level. Distributed all over the world. *Ger.* Sauerklee, *Fr.* Oseille sauvage.

Oxalis pubescens *H.B. & K.*; V 4. Roots fibrous without bulb; stem creeping or erect, elongated, leafy, pink. Stipules hairy. Leaflets, ½ to 1 by ½ to ⅔ inch, obovate or obcordate, with dark markings and a few scattered hairs. Flowers yellow, ¼ inch, in broad, irregular umbels on axillary peduncles longer than the leaves. Fruit cylindrical, narrowed upwards, torrulate by the bulging of the seeds. **t. 48.**

Ootacamund on the Snowdon road, as a garden-escape.

Very similar to O. corniculata in habit but larger and quite distinct in the dark markings on the leaves.

Oxalis variabilis *Lindl.*, var. **rubra**; V 5. Distinguished from all our other species by the flowers, large and solitary, not umbelled, on short peduncles; and the leaflets rounded or obtuse, not emarginate. Bulb dark, 1 to 2 inches, smooth. Leaf-stalk 1 to 2 inches densely pubescent; leaflets pubescent, gland dotted, broadly rhomboid, rounded at the end. Flower-stalks equal to or shorter than the leaves, one-flowered. Corolla 1¼ inches, funnel-shaped erect, tube yellow and limb cerise-pink. Inner stamens toothed. **t. 49.**

Ootacamund by roadsides and in waste places. A beautiful species, native of South Africa, introduced no doubt as a garden plant. First brought to England about 1794.

Oxalis tetraphylla *Cav.*; V 6. Remarkable for the leaflets being usually four, and marked with a broad V of darker colour. Bulb very scaly, 1 to 1½ inches. Leaf-stalk 8 inches, scapes longer, flowers umbelled on pedicels

of 1 inch. Petals $\frac{5}{8}$ inch pink or red on upper side, white on lower. **t. 50.**

A native of America (Mexico), introduced as a garden plant and spreading rapidly by its bulbs, now in many places, especially Kotagiri and lower levels and on the Shevaroys, a troublesome weed.

Oxalis latifolia *H.B. & K.*; V 7. Bulb $\frac{1}{4}$ inch, of fibrous scales. Leaf-stalks 5 to 8 inches; leaflets three, 1 by $1\frac{1}{4}$ inches, triangular, broader than long, with triangular (straight sided) notch. Scapes 5 to 10 inches, flowers umbelled; pedicels slender. Petals $\frac{1}{2}$ inch, blue, purple or purple-violet, with greenish base. **t. 51.**

Native of Mexico, in some places a troublesome weed.

In the figure: *a.* staminal column; *b.* projection at base of the filaments of the long stamens and attached thereto; *c.* styles protruding between the filaments (*E.T.B.*).

Oxalis pes-capræ *Linn.*; V 8. Leaves all from the bulbous root-stock; leaflets deeply two-lobed like the last but $\frac{1}{2}$ inch only, glabrous, spotted red or brown. Flowers yellow, an inch or more across, facing upwards; petals rounded: buds pendulous. **t. 52.**

A native of the Cape of Good Hope, introduced into England in 1757. Curtis Bot. Mag. t. 237. A troublesome weed among Potato because of its long conical tubers.

Oxalis corymbosa *DC. Prod. I, p.* 696. Bulbs numerous about $\frac{1}{4}$ inch, scapes hairy bifid or branched corymbosely. Flowers numerous, pale pink, on often 1 inch long slender pedicels. Leaflets notched, the lobes so formed rounded (quite distinct from last two species).

Shevaroys: on coffee estates—a native of Bourbon and Mauritius.

BIOPHYTUM. F.B.I. 32 VI.

Capsule splitting down the backs of the carpels, and also down the partitions into five boat-shaped valves which spread out flat, with the seeds on the placentas (normal loculicidal dehiscence). Herbs. Leaves even-pinnate, crowded or whorled at the top of the stem, which may be branched; stalks swollen at the base. Flowers umbelled on terminal peduncles, small, yellow. Stamens ten, all fertile; five long, five short. (*Cf.* OXALIS.) Stigmas notched or two-fid. Capsule ovoid opening as above.

Species 20, in tropical Asia, America and Africa.

Named from the Greek BIOS, *life, and* PHYTON, *leaf, because the leaves are sensitive.*

KEY TO THE SPECIES.

a { Stem simple, terminal leaflets largest . B. candolleanum.
  Stem usually branched; terminal leaflets not longest . b

b { Leaflets 15 to 25 pairs, pedicels $\frac{1}{6}$ inch, sepals glandular. B. intermedium.
  Leaflets 30 to 50 pairs; pedicels $\frac{1}{10}$ inch, sepals glabrous. B. polyphyllum.

Biophytum intermedium *Wight; F.B.I.* i 438, VI 7. A small woody plant, an annual, or with thick rootstock and branching stems, which end in flat whorls of pinnate leaves and umbels of small flowers on slender peduncles.

Branches slender clothed above with fine deflexed hairs, and enlarged at the insertion of the leaves. Leaves all terminal, 2 to 3 inches long, oblanceolate, the terminal leaflet being shorter than the middle ones. Leaflets twenty to thirty pairs, sensitive, thin, oblong-oblique with midrib mucronate near the forward angle, more or

less hairy on both sides ; lateral veins numerous and close set. Peduncles slender, very pubescent, swollen at the top ; pedicels umbelled, $\frac{1}{8}$ to $\frac{1}{4}$ inch, pilose. Calyx campanulate, $\frac{3}{16}$ inch ; sepals, free, narrow, acute covered with glandular hairs. Petals yellow, not spreading widely. Stamens of two lengths, the outer five half the length of the inner : anthers dorsifixed : filaments broadening slightly towards the base. Styles as long again (three times the length of the shorter stamens) clothed with short erect hairs : stigmas capitate. Capsule $\frac{1}{8}$ inch, membranous, hairy, enclosed in the sepals and ending in the equally long persistent styles. Seeds one or two in a cell, oval, shining, with two or three spiral rows of minute red warts, and down the whole length of the ventral side a broad red scar. **t. 53.**

Pulneys : near Kodaikanal. Not collected on the Nilgiris and recorded from nowhere else in India.

The plant flowers apparently its first season, and is to be found therefore as an annual, with slender but woody forked stems and no rootstock. Ceylon specimens (the type in F.B.I.) have thick rootstock ; and in F.B.I. this Pulney plant is separated, as var. *pulneyense*, because of this difference of habit. It is also a stronger growing plant than the Kandy one. Our plant is however to be found also with perennial rootstock and woody stem ; so the distinction may not hold good.

Biophytum Candolleanum *Wight ; F.B.I.* as *var.* Candolleanum of B. sensitivum i. 437, V 1. Stem simple, leaflets 10 to 15 pairs. Wt. Ill. t. 62.

Nilgiris : Coonoor, etc., 6,000 feet in shady places.

Biophytum polyphyllum *Munro ; F.B.I.* i. 439, V 8. Stem stout umbellately branched. Leaves very long and flexuous with minute leaflets, 30 to 50 pairs, $\frac{1}{8}$ inch long only ; rachis villous with long hairs.

Nilgiris : Kundahs, etc. 6,000 to 7,000 feet [*G.F.M.P.*].

BALSAMINEÆ.

IMPATIENS. F.B.I. 32 VIII.

Balsam.

The Balsams are easily recognized, but the flower may need some explanation. There are three sepals, only very occasionally five, and of these two are green and very small, while one is coloured like the petals and almost indistinguishable from them. This large sepal is usually prolonged downwards as a sac or spur, and fits closely in front and underneath, with the spur pointing forwards. There are apparently also only three petals; one, on exactly the opposite side of the flower to the spurred sepal, is outside the others in bud and is usually called the *standard*; each of the other two has a slit dividing it into two lobes, and is in reality made up of two petals more or less fused together. These *wings*, as they are usually called, hang down or project horizontally in front over the lip of the spurred sepal, and in some species, the "Orchid Balsams" look together very like the labellum of an orchid. In the centre of the flower are five stamens packed tightly round the ovary, their anthers joined together and showing their nature only in the five narrow slits from which pollen oozes out. The ovary has five cells with very thin partition walls and a number of ovules. In fruit it becomes a long and narrow, or a comparatively short and fat, barrel-shaped pod, the sides of which have a tendency to curl up inwards, and do so when ripe so violently that the seeds are ejected some considerable distance. It is to this explosiveness of the capsule that the genus IMPATIENS owes its name.

The flower is therefore on the 5, 5, 5, 5 plan, except that two of the sepals are usually absent; and its peculiar

appearance is due to the differences of size of the sepals and petals, and the fusion of the lateral pairs of petals to form the wings. A spurred sepal occurs also in TROPÆOLUM, the common garden " Nasturtium" ; and also in PELARGONIUM, the garden "Geranium" where however it is fused to the flower-stalk and so invisible. Both these genera are included in the family GERANIACEÆ of the Gen. Plant. The stem is usually smooth, more or less translucent, and conspicuously swollen at the nodes ; and the leaves are always crenate or serrate, with rounded teeth ending in sharp points which at the base of the leaf, where there are hardly crenations, appear as glandlike hairs perhaps $\frac{1}{16}$ inch long.

The genus IMPATIENS, the true Balsams, is one of the largest among flowering plants, there being over 400 species described, and is found chiefly on the mountains of tropical Africa and south-east Asia (India, China and Malaya). North America has two species only, Europe one, Siberia two, Japan four—these are all closely allied ; while in tropical Africa there are nearly fifty species, in India about two hundred and in China about as many. But there are none at all in Australia, New Zealand, Polynesia, or the whole continent of South America, so that this is essentially a genus of the Old World tropics, with Borneo and the Phillipines as the eastern limit. In India itself, the distribution is remarkably local. There are six well-defined regions, and of the two main series into which the species naturally fall (130 with short swollen spindle-shaped pods, and 60 with long and narrow or club-shaped ones) one only of the first occurs in the north-western Himalayas, and of the second not one in South India, Ceylon or the Malay Peninsula. The Western Ghauts are peculiarly rich in species, especially Travancore, and out of the 54 species described from the Nilgiris and the mountains to the south, 24 are peculiar to the Pulneys and Travancore. Most of these grow however at lower elevations than ours.

The narrowness of the distribution of each series and of most of the species, seems to point to their having arisen in their separate areas after the conditions, whether of climate or some other factor which had allowed of free intercourse between the areas had passed away and left parts of the genus isolated on the higher hills : for the hot plains between are barriers for such a delicate plant, as impossible of crossing as are the seas to most animals. A similar confinement of species to small areas was found by Charles Darwin in the flora of the Galapagos islands, off the coast of South America, by Bates in the butterflies of districts separated by the tributaries of the Amazon, and perhaps most remarkable of all, in the snails that inhabit the deep valleys of Hawaii. It was a strong argument in favour of the theory that species are not immutable and that new ones may arise in isolated areas when there is no general mixing with the main stock to prevent divergence.

In the following key divisions with sections (§ 1. Scapi geræ, etc.), is taken from Sir Joseph Hooker's "Epitome of the Indian species of Impatiens," published 1904—1906. *Rec. Bot. Surv. Ind. IV.*

KEY TO THE SPECIES.

a { No ordinary leafy stem above ground, the leaves all from the rootstock; flowers racemed on slender leafless stems (§ 1. *Scapigeræ*) . . . . *d*
Stem above ground leafy . . . . *b*

b { Flowers on axillary pedicels . . . . *c*
Flowers in very short umbel-like racemes, which are peduncled (§ 6. *Sub-umbellatæ*) . . . . *r*
Flower in distinct racemes, peduncled (§ 7. *Racemosæ*) . *v*

c { Sepals long. Annuals with opposite ls. (§ 3. *Annuæ*) . *h*
Sepals minute. Shrubs mostly (§ 4. *Microsepalæ*) . . *k*
Sepals broad. Hairy shrubs (§ 5. *Tomentosæ*) . . . *o*

d { § 1. *Scapigeræ. Orchid Balsams. The wing petals are each cut into oblong lobes and together remind one of the lip of an orchid.*
Wing divided into 3 nearly equal lobes . . . . . *e*
Wing of 2 nearly equal lobes and a third much shorter. *g*
Distal (inner) lobe long and tubiform, lateral smaller, flower 1 inch white on wet moss . . . . 10. I. neo-Barnesii.

e { Spur oblong, straight or curved: shorter or not much longer than flower . . . . *f*
Spur slender much longer than flower, up to 3 inches . 1. I. scapiflora.

f { Flower carmine, on wet rocks . . . . 3. I. Levingei.
Flower white, in grass . . . . 2. I. clavicornu.
Flower mauve, in shade . . . . 4. I. modesta.

g { Spur long slender. Flower white or pink, 1 inch or more . 5. I. acaulis.
Spur $\frac{1}{2}$ inch bulbous at base. Flower white or pink . . 6. I. laticornis.
Spur $\frac{1}{2}$ inch flattened laterally into which fits a thorn-like extension of the distal lobe of each wing . . . . . 8. I. Lawsoni.

g Spur $\frac{1}{3}$ inch cylindrical curved, basal lobe obliquely ovate . . . . 8-b. I. Sp. ?
Spur $\frac{1}{8}$ inch triangular, basal lobe rounded . . . . 8-a. I. Sp. ?
Spur $\frac{1}{8}$ inch cylindrical. Mid lobe of lip widest, basal erect . . . . 7. I. nilagirica.
No spur. Flr. $\frac{1}{2}$ inch brown lobes 2 slender . . . . 9. I. orcheoides.

h § 3. *Annual. Flowers. Annual herbs with opposite leaves. Flowers on axillary pedicels and black, smooth seeds.*
Spur slender . . . . *i*
Spur $\frac{1}{6}$ inch, stem red tomentose 15. I. tomentosa.
No spur . . . . *j*

i Flowers over 1 inch. Fruiting pedicels stiff deflexed, marshplants . . . . 11. I. chinensis.
Flowers $\frac{3}{4}$ inch . . . . 12. I. tenella.

j Stem 1 foot, firm. Flowers $\frac{3}{4}$ inch diameter. . . . . 14. I. rufescens.
Stem slender, under 1 foot. Flrs. small. 13 I. pusilla.

k § 4. *Microsepalæ. Leaves opposite, alternate or whorled. Flowers in slender axillary pedicels; sepals minute. Mostly shrubs.*
Ls. opposite or whorled or alternate on the same plant . *m*
Leaves all alternate ; no spur 21. I. scabriuscula.

l Basal lobes of wings smaller than the distal . . . . *n*
Basal lobe equal to or larger than the distal . . . . p

m Leaves usually whorled, crenate . . . . *o*
Leaves alternate narrow, serrate, spur long. . . . 20. I. Balsamina.

n Stem reddish. Leaves 1 to 3 inches long ; petiole short. 16. I. Leschenaultii.
Sulphury. Spur slender, flower facing upwards ; fruits erect. Leaves 2 to 4 inches . . . 17. I. latifolia.

o Spur stout. Stem glaucous. Midrib of leaf hairy underneath . . . . 18. I. cuspidata.
Spur slender. St. green. Lf. glabrous . 19. I. floribunda.

p. § 5. *Tomentosæ. Shrubby plants. Leaves hairy on both sides. Pedicels solitary in the leaf-axils. Standard and lip of flower tomentose.*
Flowers small, white or red, wings short. . . . . . 22. I. Munronii.
Flowers to 1½ inches across, white ; wings large. 23. I. Henslowiana.

q. § 6. *Subembellatæ. Flowers in umbels or umbel-like, very short racemes, on axillary peduncles, the pedicels with bracts at the base.*
Shrubs. Leaves alternate . . . . *r*
Herbs. Leaves opposite . . . . *t*

r. Flrs. white, bonnet-shaped, without spur. . . . . . 26. I. campanulata.
Flowers pink, spur longer than lip . . . . *s*

s. Tall shrub under the shade of trees. Bracts slender. 24. I fruticosa.
Herb of wet ground. Bracts ovate . . . 25. I. viscida.

t. Leaves ovate, long-stalked 27. I. Goughii.
Leaves oblong or elliptic, subsessile . . 28. I. omissa.

u. § 7. *Racemosæ. Leaves alternate. Flowers in peduncled axillary racemes. Pedicels bracteate at the base. Sepals broad. Lip spurred.*
Flowers scarlet ; lip tubi-form 30. I. phœnicea.
Flowers pink : lip boat-shaped with slender spur. . *w.*

w. Leaves lanceolate sessile . . . . . . 31. I. Tangachee.
Leaves ovate, stalked . . . . 29. I. sp.

§ 1. *Scapigeræ—'Orchid Balsams.' The wing petals are each cut into oblong lobes and together remind one of the labellum of an Orchid.*

1. **Impatiens scapiflora** *Heyni ; F.B.I.* i 443, VIII 7. Flowers on slender 1-inch pedicels pink or white. Wings 1 inch long, deeply cut into 3 nearly equal lobes ; standard ⅓ inch ; spur 2 inches incurved. Leaves ovate-oblong, shallowly cordate, serrate from base to apex, 2½ to 4 inches long, on petioles of 2 to 4 inches. Scapes as long or longer, perfectly glabrous. **t. 54.** Wt. Ic. 751.

Nilgiris : On wet rocks on the western margin and at lower levels.

Gen. Dist. Western Ghauts, from South Kanara to Travancore, 6,000 to 8,000 feet.

2. **Impatiens clavicornu** *Turcz ; F.B.I.* i 442, VIII 1 as I, Beddomii *Hook f.* Flowers mainly white ; wings ¾ by ½ inch, cut into three oblong lobes, tinged with yellow at the base ; spur shorter, curved forwards, sometimes yellowish with touches of red ; standard ¼ inch, hood-shaped, and arching over and concealing the anthers and style, white or reddish on the back. Capsule ⅓ inch, elliptic ; seeds granulate. Rootstock ½ inch thick. Leaves circular-reniform or cordate, entire or with shallow crenations ending in short red points, fleshy ; veins mostly from the base, arching forwards. Scape up to 12 inches high and ⅙ or more thick at the base, white or blotched with red ; bracts ¼ inch, edged with red ; pedicels slender, 1 inch, similarly coloured. **t. 55.** Wight Ic. 967.

In grass on the open downs, flowering plentifully July to September after the rains. Not collected on Pulneys.

3. **Impatiens Levingei** *Gamble* ; *Rec. Bot. Surv. Ind.* IV 45. Flowers carmine : lobes of wing nearly equal, ½ inch long. Spur ¾ inch oblong curved. Leaves nearly round. Very similar to I. clavicornu in form. **t. 56.**

Nilgiris : On wet rocks on the margins of our area Coonoor Lamb's Rock. Road. Slope below Biccapatti.

4. **Impatiens modesta** *Wight, Herb. Prop ! ; F.B.I.* i 442, VIII 2. Flowers mauve-pink, up to ¾ inch diameter, the spur ⅕ inch only, and curved backwards ; wing of 3 narrow lobes, the middle one shortest, spotted near the base. Leaves up to 5 by 4 inches, ovate or oblong, the base deeply cordate, acute or obtuse, coarsely crenate, with a few hairs scattered over the surface and margin.

Scape 3 to 10 inches tinged with red; bracts $\frac{1}{8}$ inch; pedicels $\frac{1}{2}$ to $\frac{3}{4}$ inch, very slender. Capsule $\frac{1}{6}$ to $\frac{1}{4}$ inch, acute at both ends. **t. 57.** Wight Ic. t. 968.

Nilgiris: in shady places, Pykara, Coonoor, Naduvattam. Not collected on the Pulneys.

Not recorded northwards in the Bombay Ghauts (C.B.F.).

In the figure: *a.* fruit natural size; *b.* same burst; *c.* the contents—a median placenta with numerous seeds attached, many have dropped off and show their attachments; *d.* enlarged seed showing hairs (*E.T.B.*).

5. **Impatiens acaulis** *Arn.; F.B.I.* i 443, VIII 6. Stem 2 to 12 inches. Flower pink or white, 1 to 1$\frac{1}{2}$ inches wide. Wings of two spreading lobes, and much smaller basal lobe. Spur long and slender. Leaves round, ovate cordate, or oblong, usually on slender petioles, more or less crenate, glabrous. **t. 58.**

Nilgiris: on the western edge to 8,000 feet on wet rocks: Avalanche, Kundahs. Shevaroys: under Shevaroyan.

6. **Impatiens laticornis** *C. E. C. Fischer; Kew Bulletin* 4. 1930, *p.* 154. Flowers white with yellow or orange hairs or pink with magenta hairs, 1 to 1$\frac{1}{2}$ inches across. Two lobes $\frac{1}{4}$ to $\frac{1}{3}$ inch rounded. Spur $\frac{3}{4}$ inch stout, curved, inflated at the base as a bulb. Basal (rear) lobe of wing $\frac{1}{8}$ inch, ovate, obliquely backwards, incurved inside the lip. Leaves heart-shaped or nearly round with wide basal sinus, and very shallow crenations, 1 to 1$\frac{1}{2}$ inches, hairy on upper side. Scape 5 to 10 inches. Plant increases by stolons. **t. 59.**

Nilgiris: Kundahs at 8,000 feet. Flower September (*E. Barnes*).

"Common on wet rocks and on tree trunks and other shady places exposed to rain and mists from Malabar." *E. Barnes.*

7. **Impatiens nilgirica** *C. E. C. Fischer, Kew, Bull.* 1931, 41. Flowers light to pink. $\frac{3}{4}$ inch long. Lip

three-lobed, the distal longer and narrower than the ovate middle lobe : basal lobe, broad oblong, truncate with slightly concave margin outwards ; erect : all three with thick hairs on the palate. Spur short. Stems from 6 to 12 inches, leaves broadly ovate or nearly round **t. 60** (like I. clavicornu).

Nilgiris : in grass on Kundahs 8,000 feet. Flower September (Cdl. *E. Barnes*).

8. **Impatiens Lawsoni** *Hook.; Rec. Bot. Sur. India* IV. 45. Remarkable for the spur being compressed laterally, and enclosing a spiniform extension at the base of each distal lobe of the wings. Leaves cordate to elliptic, hairy : veins on under side red with bulbils.

Nilgiri : Kundahs on wet rocks in dense shade of wet shoias. The species was not described by Hooker. I am indebted to Mr. E. Barnes for this amount of description.

Two other plants have been collected by Mr. E. Barnes on the Kundahs in September. In both the distal lobe is produced as a very small spine which lies in the spur.

(*a*) Spur short ($\frac{1}{10}$ inch) ; basal lobe rounded.

(*b*) Spur $\frac{1}{3}$ inch, cylindrical curved ; basal lobe ovate obliquely forwards.

9. **Impatiens orchioides** *Bedd ; F.B.I.* i 443, VIII 5. A very small plant. Flowers reddish brown, $\frac{1}{3}$ inch diameter. Wing of two narrow divergent lobes $\frac{1}{3}$ inch long, and a shallow basal one ; no spur. Leaves round, ovate deeply cordate up to $2\frac{1}{2}$ inches, acuminate or not, very hairy above, glabrous beneath and with bulbils, capsule $\frac{1}{4}$ inch. **t. 61.** Bedd. Ic. t. 152.

In wet sholas, on the ground, occasionally on a mass of branches, Nilgiris : on the western margin at 8,000 feet.

10. **Impatiens neo-Barnesii** *C. E. C. Fischer, Kew Bulletin* 4 1930, *p.* 153. An epiphyte on trees. Flowers 1 inch, cream coloured or white, very fragile and soon falling. Wings two-lobed the basal lobe $\frac{1}{3}$ inch, the distal much larger $\frac{3}{4}$ by $\frac{1}{8}$ inch, tubiform. No spur. Capsule ellipsoid $\frac{1}{3}$ inch. Leaves ovate, or elliptic ovate, acute or rounded or very slightly cordate at the base, $\frac{3}{4}$ to $1\frac{1}{2}$ inches by $\frac{1}{3}$ to $\frac{3}{4}$ inch. Scape 2 to 3 inches and pedicels very slender, glabrous. **t. 62.**

Nilgiris : Kundahs about 8,000 feet. Flower September (*E. Barnes*).

" On moss covered tree trunks with its leaves and flowers hanging down, in deep shade in very wet sholas or where enveloped in mist overlooking Malabar—near top of Mukarte, etc. In the few specimens I saw, the wing petals were curled to form a tube and were dripping water." *E. Barnes.*

§ 3. *Subverticillatæ. Flowers on axillary pedicels. Annual herbs ; leaves all opposite.*

11. **Impatiens chinensis** *Linn. ; F.B.I.* i 444, VIII 10. Stem unbranched 4 to 20 inches high, from a thickened, rooting, prostrate base ; glabrous. Leaves all opposite, very shortly stalked, 1 to 4 inches long and a sixth to a quarter as broad, ovate, acute, oblong or lanceolate, not narrowed to the base, sharply serrate ; lower side silvery-grey ; nerves three pairs, not hairy ; stipules linear, $\frac{1}{8}$ inch. Pedicels solitary or in fascicles, slender, $1\frac{1}{2}$ to $2\frac{1}{2}$ inches, deflexed usually in fruit, but sometimes not. Flowers mauve-pink or white, $1\frac{1}{4}$ inches across ; spur 2 inches slender, curving forwards ; lateral sepals $\frac{1}{3}$ by $\frac{1}{6}$ inch ; wings with one large lobe slightly indented on the inside, and one much smaller on the outside (usually covered). Capsule $\frac{1}{2}$ to $\frac{3}{4}$ inch : seeds black and shining The stiffly deflexed fruiting pedicels are very characteristic **t. 63.** Wight Ic. t. 748.

One of the commonest species here wherever the ground is a little moist ; very variable in size.

Gen. Dist. Throughout the Western Ghauts down to 3,000 feet in Mysore, Assam, Bhotan, Khasia, and westwards to Burma and China. For a Balsam the distribution is unusually wide.

12. **Impatiens tenella** *Heyne ; F.B.I.* i 446, VIII 15. Stem branched succulent. Leaves all opposite, $\frac{1}{2}$ to 3 inches ; lowest smallest petioled, upper often dilated at the base. Pedicels slender, solitary or in pairs, in the leaf axils, deflexed in fruit. Flowers flat, rosy ; spur curved upwards, as long or longer than the flower. Pod $\frac{1}{3}$ inch. Seeds few, black globular, shining. **t. 64.**

Nilgiris : Naduvattam, flower. September.

Gen Dist. Nilgiris.

Western Ghauts : 6,000 feet.

13. **Impatiens pusilla** *Bentham* (in Fl. N. & P. as I. inconspicua *Benth.*) *; F.B.I.* i 447, VIII 18. A small plant 4 to 7 inches high, with numerous branches, the lowest almost as long as the stem rather thick and flaccid, glabrous. Leaves all opposite, from $\frac{1}{2}$ by $\frac{1}{5}$ to $1\frac{1}{4}$ by $\frac{1}{2}$ inch, elliptic, acute at both ends, with a few (six or fewer) bristle-like teeth on each margin, whitish below, occasionally pubescent above ; veins inconspicuous. Pedicels solitary or in pairs, hairlike, $\frac{1}{4}$ to $\frac{1}{5}$ inch, with a line of red pubescence, deflexed in fruit. Flowers $\frac{1}{4}$ to $\frac{1}{2}$ inch : lateral sepals linear lanceolate, nearly as long : lip without spur, hardly even saccate : wing with large round terminal lobe and small linear lateral one near the narrow base, purplish with white ends. Capsule $\frac{3}{4}$ inch with about five globose, black, shining seeds $\frac{1}{16}$ inch diameter. **t. 65.** Wight Ic. t. 970.

Nilgiris : Dodabetta, flowering September. Not collected on Pulneys.

Gen. Dist. Mountains of the Western Peninsula, 3,000 to 8,000 feet.

A very variable plant. It may be only a few inches high unbranched or branched (t. 65 left) : the flowers white blotched with pink : or in long grass it may be 8 inches high with very narrow leaves and almost colourless flower. (t. 65 right). The latter is what *Wight* figured as I. ? ros marinifolia Ic. t. 750.

14. **Impatiens rufescens** *Benth. Wall. Cat.* 4747 *! ;* VIII 23 ; Pink Marsh Balsam. Stems numerous, weak and decumbent at the base, and rooting at the much swollen nodes, rising up in clumps ; pinkish, very hairy (for a Balsam) and flaccid. Leaves all opposite, thick, white below, with short silvery hairs on the upper side ; faintly serrate, the teeth hardly more than mere points $\frac{1}{6}$ to $\frac{1}{3}$ inch apart : lower leaves obovate-obtuse, narrowed to the short petiole ; upper oblanceolate or oblong-ovate, cut off square at the base : veins three or four pairs. Pedicels, slender, $1\frac{1}{2}$ to 2 inches, hairy. Flowers $\frac{3}{4}$ inch. Lateral sepals $\frac{1}{3}$ by $\frac{1}{12}$ inch linear-acute, hairy. Lip with a sac $\frac{1}{6}$ to $\frac{1}{4}$ inch deep but no spur. Standard rose-pink, nearly circular, distinctly keeled, mucronate. Wing petals pinkish-purple or mauve ; the outer (and main) lobes rounded $\frac{1}{4}$ inch across ; posterior lobe $\frac{1}{10}$ inch wide, falcate. Capsule $\frac{1}{3}$ to $\frac{5}{8}$ inch. Seeds dark brown, smooth and shining. **t. 66**. Wight Ic. t. 969.

Nilgiris : in swamps, Ootacamund downs, Dodabetta. Pykara on bank above the rapids. Not recorded from other hills.

In F.B.I. and in G.F.M.P. this species is reduced to I. tomentosa *Heyne* from which however it seems to me to differ in several respects prominently in not having the small horizontal spur at the bottom of the sac (Wight No. 453 and his I. ovalifolia !)

In the figure : *a.* two-lobed lateral petal ; *b.* the anterior petal (outer in bud) ; *c.* a narrow lateral sepal ; *d.* posterior sepal (anterior in flower). It is petaloid and produced into a hollow sac (E.T.B.).

15. **Impatiens tomentosa** *Heyne, Wight's Kew dist. No.* 317 *and Ic. t.* 749 *; F.B.I.* i 449 *ex parte,* VIII 23 ; Red Liberty Cap. Stems usually a little branched below,

red, very variable as regards hairiness, from glabrous to densely pubescent in the same locality, and as regards length running up to 18 inches and rooting at the lower nodes in water of varying depth, but by the edge of deep constant pools short and erect. Petioles variable, $\frac{1}{4}$ inch or less. Upper leaves narrow, oblong-acute, $\frac{3}{4}$ to $1\frac{1}{2}$ inches by $\frac{1}{4}$ inch ; lower shorter and broader, the lowest sometimes $\frac{1}{4}$ inch only and nearly as broad ; variable like the stem in respect of hairiness ; remotely serrate with pink-tipped teeth. Stipules only on fully developed leaves, as short soft spines which early wither and fall. Flower-stalks one to three, usually three, the middle bud not opening ; glabrous or pubescent, but always with a single line of pubescence following the twist of the stalk from the upper side at the base to the lip ; $\frac{1}{2}$ to $\frac{3}{8}$ inch but lengthening continuously till in fruit about 1 to $\frac{1}{8}$ inch long ; with a small persistent bract at the base. Buds pointed, the standard covering the back completely. Flowers $\frac{1}{3}$ to $\frac{1}{2}$ inch of various shades of rose pink to almost yellowish white in the more pubescent forms : wings mauve or magenta, splotched with dark purple near the crimson base. Spur short somewhat variable but always present : lateral sepals linear $\frac{1}{4}$ by $\frac{1}{20}$ inch : wing with one large lobe narrowed at the base where it joins the other much smaller one, rather larger in the more pubescent forms and projecting over the edge of the lip. Capsule pointed at each end, about $\frac{1}{3}$ by $\frac{5}{32}$ inch. Seeds about five, black, smooth and shining, but slightly compressed from a globose shape ; not variable. **t. 67.** Wight Ic. t. 749.

Pulneys : on the Kodaikanal downs. *Fyson* 351, 354. *Bourne* 316, 503, 5208.

The above description is taken very largely, and in part verbatim, from a note made by Sir Alfred Bourne, " after examination of many living

specimens." The plant is quite common on the Kodaikanal downs wherever there is water (and there are several streams and much marshy land there), and occurs in such varying states as regards size and hairiness hat it is impossible to separate it into two varieties though the extremes might almost be considered sufficiently distinct to be classed as species. Its most constant characteristic features are the redness of the stem and the peculiar short-spurred lip, in shape like an inverted cap of liberty. I. rufescens *Benth.* united with this in *F.B.I.* and in *G.F.M.P.* seems to me to be quite a different plant.

§ 4. *Leaves alternate or opposite; bush or shrubby plant.*

16. **Impatiens Leschenaultii** *Wall. Cat.* 4739*!*; *F.B.I.* i 450, VIII 27; common shrubby Balsam. A well-branched very leafy plant 2 to 3 feet high (or more in shady places) with stem at the base as thick as the finger: branches perfectly glabrous, smooth, conspicuously swollen at the nodes. Leaves sub-opposite or whorled: blade $\frac{3}{4}$ to 2 by $\frac{1}{4}$ to $\frac{5}{8}$ inch, elliptic, acute at both ends or acuminate, crenate, with a few very distinct hair-points "$\frac{1}{16}$ inch long" towards the base, glabrous; petioles shorter; stipules linear, $\frac{1}{10}$ inch. Flowers nearly white, with some pink. Flower-stalks mostly solitary in the upper axils, 1 inch, very slender, glabrous. Lateral sepals minute: lip boat-shaped, yellow: spur slender tinged with red on the lower side, and ending in a slightly swollen yellow tip. Corolla open, nearly flat, 1 by $\frac{3}{4}$ inch: terminal lobe of wing $\frac{1}{2}$ to $\frac{3}{4}$ inch, nearly straight on the inside but notched near the end and broadest opposite this notch; lateral lobe smaller triangular, $\frac{3}{8}$ by $\frac{1}{4}$ inch. Standard, circular, notched at the top with small spur behind. Capsule up to $\frac{5}{8}$ by $\frac{3}{8}$ inch. Seeds thickly rugose. **t. 68.** Wight Ic. t. 970 *bis.*

Common near Ootacamund in shady places or even where partly exposed as on the edge of a shola, and in flower at all times.

This is the wild Balsam most commonly grown in gardens at these levels.

17. **Impatiens latifolia** *Linn.* ; *F.B.I.* i 450, VIII 26. In general habit and shape of leaflike I. Leschenaultii but larger, leaf-stalks and blades 2 to 4 inches long. Stem grooved. Fruiting pedicels erect, flowers pink-purple or white, flat and facing upwards basal lobe of wing smaller than the apical. **t. 69.**

Nilgiris : Naduvattum to Pykara by streams. Coonoor : by stream in Sims Park.

In t. 54 : *a.* pedicel with lip boat-shaped lip and spur, staminal column and standard in face view ; *b.* pedicel with lateral sepals and standard from behind ; *c.* a two-lobed wing (*E.T.B. sheet No.* 6147).

18. **Impatiens cuspidata** *Wt.* ; *F.B.I.* included in I. latifolia. A shrub, 3 to 5 feet, well branched. Stems and branches covered with bluish white powder. Leaves serrate alternate, opposite or several at a node, often unequal in size, petioles with glandular filamantous outgrowths ($\frac{1}{8}$ inch) mid-rib hairy below. Flowers pale pink ; standard broadly obcordate, nearly flat ; lip small with long straight spur ; basal lobe of wings much longer and broader than the distal and notched. Wight Ic. t. 741.

Nilgiris : Coonoor on Lamb's Rock Road, common. May —September.

19. **Impatiens floribunda** *Wt.* ; *F.B.I.* incl. in I. flaccida *Arn.*, i. 457 VIII 50. Habit of the last two, but inner or apical lobe of wing quite small.

Nilgiris to Travancore, 6,000 to 7,000 feet. Not seen here.

20. **Impatiens Balsamina** *Linn* ; *F.B.I.* i 453 ; VIII 37. Stem usually not branched. Leaves alternate, narrow lanceolate, deeply serrate. Flowers on slender axillary pedicels, large rose-coloured. Wings very broad, distal

lobe much larger than the basal. Capsule tomentose. Spur long, incurved. Seeds globose, tubercled.

Shevaroys common ; Horsleykonda.

Throughout tropical and sub-tropical India with much variation. The original of the common garden Balsam.

21. **Impatiens scabriuscula** *Heyne ; F.B.I.* i 454, VIII 38. A small plant, 4 to 10 inches, branched from the base. Leaves petioled, narrowly elliptic, lanceolate to obovate, 1 to 2 inches. Flowers ½ inch, pink. Lip and standard hairy. Wings three-lobed, the middle lobe more than twice the outer, and the inner lobe very small. No spur. Capsule ⅓ inch, ellipsoid, mucronate, villous. Seeds few, globose dark brown, tubercled. **t. 70.** Bedd. Ic. cxliv.

Nilgiris : 6,000 feet at Naduvattam. Flower September.

Gen. Dist. Western Ghauts, from South Kanara and Coorg to Wynaad and Nilgiris.

The entire absence of even a vestige of a spur is remarkable in a Balsam.

§ 5. *Tomentosæ. Shrubby plants ; leaves hairy on both sides ; pedicels solitary in leaf-axils ; standard and lip of flower tomentose.*

22. **Impatiens Munronii** *Wt. ; F.B.I.* i 456, VIII 48. An undershrub up to 2 feet, sparingly branched. Leaves hairy on both sides, 3 to 4 by 1½ to 2 inches, elliptic, acuminate. Flowers, on axillary pedicels with pink wings paler standard and white spur. Standard helmet-shaped with greenish keel. Spur hairy like the leaves, tapering nearly evenly from the boat-shaped lip to the slightly swollen curved tip (similar to that of *I. phœnicia*, t. 76). Wt. Ic. t. 1049.

Nilgiris : Sispara jungles in dense shade (*Wight*). Kundahs (*Barnes*).

23. **Impatiens Henslowiana** *Arnott ; F.B.I.* i 458, VIII 53. An undershrub easily recognized among our Balsams by the very large white flowers. Branches with prominently swollen leaf scars. Leaves 3 to 5 inches, crowded at the ends of the branches, petioled, elliptic, hairy on both sides. Flowers 1 to 2 inches diameter, on stout axillary pedicels, white with pinkish tinge at the base of the petals. Wings deeply divided into two broad flat parts, the distal ones also notched. Spur longer, curved up slightly. t. 71. Wt. Ic. t. 743.

Pulneys : in ravines and clefts of rocks and on steep banks, up to 7,000 feet, near Poombari, Neutral Saddle, etc.

Gen. Dist. Western Ghauts, 2,000 to 7,000 feet.

§ 6. *Subumbellatæ. Flowers in umbels or umbel-like very short racemes on axillary peduncles ; pedicels with bracts at the base.*

24. **Impatiens fruticosa** *DC. ; F.B.I.* i 459, VIII 57. An erect much-branched shrub, up to 8 feet high. Branches glabrous, but leaves hairy on the underside ; peduncles 1 to 2 inches, dividing into 3 or 4 pedicels bearing the flowers. Flowers 1½ inches, pink ; lobes of the wings two, well separated ; spur 1 to 1½ inches. Capsule erect. t. 72. Wight Ic. t. 966.

Nilgiris : Coonoor and Kotagiri, near streams in jungles.

Gen. Dist. Western Ghauts, Nilgiris, Pulney and Travancore hills, 5,000 to 6,000 feet.

25. **Impatiens viscida** *Wight, Herb Prop. ! ; F.B.I.* i 462, VIII 65. A small herb of very wet rocks. Stems red, decumbent and rooting at the lower nodes. Leaves petioled, ovate-acute, about 2 by 1½ inches. Flowers light purple or pink, two or three together on a slender axillary peduncle of about 2 inches ; bracts ¼ inch ; sepals ⅓ by

$\frac{1}{4}$ inch, light brown; hinder lobe of wing about one-third only the size of the distal, which is nearly semi-circular in shape and $\frac{3}{4}$ inch long; standard $\frac{1}{3}$ inch, concave; spur 1 to $1\frac{1}{4}$ inches, bent at upper end then lying nearly straight close under and parallel to the wings, in bud curled up over the rest. Capsules erect. **t. 73.** Wt. Ic. t. 746.

Pulneys: Kodaikanal or Jesuits Walk near Pambar, etc., on dripping rocks.

Gen. Dist. Madura and Tinnevelly hills, 3,000 to 7,000 feet.

26. **Impatiens campanulata** *Wight; F.B.I.* i 463, VIII 70. A stout herb, $1\frac{1}{2}$ feet high and upwards, not much if at all branched, glabrous. Leaves all alternate, $3\frac{1}{2}$ to 4 by $1\frac{1}{2}$ to $2\frac{1}{4}$ inches, broadly elliptic, acute at both ends, crenate with sharp points which are especially conspicuous near the base; stalk $\frac{1}{2}$ to 2 inches. Peduncles stout 2 to 3 inches; pedicels $\frac{3}{4}$ inch, crowded (three to five) near the top, in axils of ovate-lanceolate bracts $\frac{1}{3}$ inch long. Buds ovoid-acute with a very distinct hooked point showing on the apex of the large standard, and enclosed by the sepals which hides the short swollen spur. Sepals nearly $\frac{1}{2}$ inch, broadly ovate with short acumen: lip $\frac{1}{2}$ by $\frac{1}{6}$ inch in depth, with very short slightly turgid spur. Corolla campanulate, horizontal with the lower side rather longer than the upper like a white bonnet; wings laterally concave, the terminal lobe obovate retuse or obliquely obcordate, with a small yellow auricle on the inner side near the base; lateral lobe much smaller. Capsule glabrous, turgid, pointed at each end. Seeds globose. **t. 74.** Wt. Ic t. 744.

Easily recognized by the horizontal campanulate corolla, which might be likened to an open mouth with protruding tongue, or to a white "sun-bonnet" facing upwards.

On the outskirts of sholas and in other shady places; common on the Pulneys at 7,000 feet.

No specimens from other localities seen.

27. **Impatiens Goughii** *Wight Herb.!; F.B.I.* i 452, VIII 33; Gough's Water Balsam. A delicate well-branched herb, 4 to 8 inches high, but sometimes with longer horizontal stem from which erect branches rise; quite glabrous. Leaves without stipules, mostly opposite or often two to three near each other, the internodes varying much in length: stalk $\frac{1}{8}$ to $\frac{1}{4}$ inch; blade up to 1 inch, ovate-lanceolate acute, often rounded at the base but drying acute, coarsely serrate (seven to ten teeth on each margin), glabrous, thin. Peduncles $1\frac{1}{2}$ to 3 inches, solitary in the leaf-axils but often falsely whorled, slender; pedicels falsely umbelled in the axils of minute bracts, $\frac{1}{3}$ to $\frac{3}{4}$ inch, capillary. Flowers pink, $\frac{1}{6}$ to $\frac{1}{4}$ inch across, in shape not unlike a UTRICULARIA. Buds globose. Lip shallow, spur half its length acute, curved slightly forwards. Wing petal with a slight projection at the base fitting into the spur, and two lobes: the terminal lobe with a shallow bay in the end side, the lateral lobe rectangular rounded at each end and attached at the side. Standard nearly circular with short spur just below the upper margin. Capsule ovoid, acute at both ends, $\frac{1}{6}$ inch. Seeds hairy. **t. 75.** Wight Ic. t. 1603.

By the side of streams. Pulneys: below and near Kodaikanal. Nilgiris: Pykara and below.

Gen. Dist. Western Ghauts, 5,000 to 7,000 feet.

28. **Impatiens omissa** *Hk. f.; Rec. Bot. Sur. IV, p.* 43. A very small, slender annual herb. Leaves all opposite, oblong or elliptic subsessile, $\frac{1}{4}$ to 1 inch long. Flowers in many-flowered short umbel-like racemes, on long peduncles.

Western Ghauts, Anamalai and Pulney hills, 6,000 to 7,000 feet.

29. **Impatiens** (species not traced). A shrub reaching 6 feet. Leaves hairy, 2½ inches long, ovate acuminate, serrulate : stalk ½ to ¾ inch usually with glands. Flowers racemed. Peduncle much longer than its subtending leaf, bracteate. Pedicels 1 inch horizontal. Flowers, 1 inch or more, distal (terminal) lobe ⅓ inch, rounded, basal lobe minute. Spur slender, twice as long, curled upwards. Capsule ⅓ inch glabrous.

Nilgiris : Lovedale (P. V. Mayuranathan).

Mr. Mayuranathan showed me this as I. maculata Wt., but it is much smaller in every way than the plant in the Madras Herbarium

30. **Impatiens phœnicea** *Beddome ! ; F.B.I.* i 466, VIII 81 ; Scarlet Balsam. Stem slender, branched or not, 1 to 3 feet, very dark coloured. Leaves alternate, dark green, 2 to 5⅞ by 1¼ inches elliptic-acute or occasionally ovate with blunt cusp, crenate-serrate ; stalk ½ inch. Flowers racemed, four or five along the uppermost third of axillary peduncles 2 to 4 inches long. Bracts ovate ⅙ inch, persistent ; pedicel slender, 1 inch nearly horizontal when the flower opens. Flower in shape somewhat different from other balsams, rather narrow for its depth, with the lip narrowing into the trumpet-shaped spur, and the standard more than usually helmet-shaped. Sepals ⅛ inch obliquely ovate with a short point ; lip ⅓ inch and its spur 1 inch, but the two hardly separable, blood-crimson, trumpet-shaped with swollen tip. Wings scarlet, but yellow at the base, with an oblong terminal lobe and a smaller lateral cordate one, not much exserted ; standard scarlet, deeply vaulted, with a rose-pink ridge down the middle of the back. **t. 76.**

A very striking plant, its bright scarlet flowers showing up against the dark green foliage. There are in these levels no other balsams at all like it in colour.

In woods, quite common on the Pulneys, flowering from June but mostly September to October.

Gen. Dist. Western Ghauts, Pulneys and Tinnevelly hills, above 6,000 feet.

31. **Impatiens Tangachee** *Bedd.; F.B.I.* i 467, VIII 82. Stem 6 to 15 inches, usually unbranched. Leaves crowded towards the top, oblanceolate, finely-serrate. Flowers in racemes, the lower flowerless part of the peduncle longer than the leaves; bracts $\frac{1}{8}$ inch; pedicels 1 inch. Flowers rose-pink; standard helmet-shaped; terminal lobe of wing with broadly truncate, erose tip; lateral lobe $\frac{1}{3}$ inch long; spur 1 inch, nearly straight. Bedd. Ic. t. 147.

Pulneys: in streams at 5,000 feet, etc.

Gen. Dist. Anamalais, above 4,000 feet, Bolampatti hills.

RUTACEÆ.

A family easily recognized by the very numerous small oil glands in the (usually pinnately) compound leaf, which show against the light as translucent dots. (In a few genera, one leaflet only is developed.) Flowers quite regular, with all the parts in fives or fours; calyx always very small; anthers opening inwards, and inside the stamens a prominent honey-secreting disc.

A fairly large family of 650 species, confined almost exclusively to the warmer parts of the world, more especially South Africa and Australia. In Europe it is hardly represented at all, the common Rue, Ruta graveolens *L.* a native of the Mediterranean being almost the only species found. In India the best known are the Orange, Lime, Pumelo, etc. (species of Citrus) and wood-apple (Feronia).

KEY TO THE GENERA.

a. Leaf simple, flowers in long-peduncled cyme, stamens 8. *b*
Leaves opposite, leaflets 3 ; a small tree. Evodia lunur ankenda *Merr.*
Leaves alternate, leaflets 3 or more ; erect or climbing shrubs . . . . *c*

b. Leaves opposite ; peduncles decurved ; flowers few . . MELICOPE.
Leaves opposite, peduncles erect, flowers many . . . . . ACRONYCHIA.

c. Petals 1 inch, sweet scented ; unarmed shrubs . MURRAYA
Flowers ¼ inch ; prickly shrubs and climbers . . . *d*

d. Leaflets 3 to 5, carpels in fruit dry with one black seed, wood yellow . . . . XANTHOXYLUM.
Leaflets 3 only, often climbers with warty stems, fruit a small yellow berry . . . . TODDALIA.

EVODIA. F.B.I. 33 V.

Unarmed trees and shrubs with opposite, simple or tri-foliate or odd-pinnate leaves ; and small flowers in panicled cymes, with deeply four-lobed ovary which in fruit divides into two or four hard dry carpels each with one shining seed.

Species about thirty, in tropical Asia, Pacific Islands, East African Islands, Australia.

Evodia Roxburghiana *Benth. ; F.B.I.* i 487, V 1. A small well-branched tree with dark green foliage. Leaves of three leaflets : main stalk 2 inches : stalks of the leaflets ¼ inch. Leaflets nearly equal, quite glabrous, shiny, obovate-oblong, entire, rounded at the apex or with a short point : nerves numerous, parallel, conspicuous when dry, glands minute, but leaf aromatic when crushed. Panicles long-stalked, axillary : branches horizontal. Flowers yellow-green, small, in dense clusters of ¼ inch across. Capsule light brown ½ inch. Seeds black, shiny. **t. 77.**

Nilgiris : Downs towards Pykara, Kotagiri, Biccapatti, Shevaroys. Very common in the sholas. Not at higher levels.

Gen. Dist. On lower hills, Tinnevelly, to Mysore : northward to the Khasi hills and eastwards to Ceylon, Sumatra and Java.

MELICOPE. F.B.I. 33 VII.

Shrubs with opposite 1 to 3-foliate leaves, and the parts of the flower in fours (eight stamens). Fruit of four parts which open on the inner side.

Species about 20, chiefly in Polynesia.

Melicope indica *Wt. ; F.B.I.* i 492, VII 1. A shrub or small tree. Leaflet one only, shining, 3 to 4 inches long narrowed to the base with long petiole. Flowers $\frac{1}{3}$ inch diameter, two or three together on axillary peduncles of 2 to 4 inches. Carpels in fruit $\frac{1}{2}$ inch, one-seeded. Wt. Ic. 1051.

Nilgiris in woods near Avalanche, and on the Kundahs.

XANTHOXYLUM. F.B.I. 33 VIII.

Yellow-wood.

Shrubs or trees with yellow-wood, usually prickly. Leaves alternate, pinnately three or more-foliate. Flowers small, the parts three, four, or five ; unisexual. Ovary deeply lobed ; carpels with two ovules each ; when ripe globose with one black shining seed which may hang from the opened carpel for some time.

Species 80 in the hotter parts of the world.

Xanthoxylum tetraspermum *Wight and Arnott ; Herb. Wight Prop.* 981 *! ; F.B.I.* i 494, VIII 8 *;* Common Yellow-wood. A woody climber covered all over the young parts with short curved prickles, glabrous except

for the velvety cymes. Leaves 4 to 7 inches, very prickly on the stalk. Leaflets usually five, nearly sessile, elliptic-ovate and suddenly contracted to a $\frac{1}{4}$ inch notched tip, crenate-serrate, shining above, with numerous nearly parallel veins. Panicles axillary and terminal. Flowers nearly sessile, bunched at short intervals on the alternate branches. Calyx very small. Petals four, $\frac{1}{10}$ inch valvate. Stamens twice as long. Ripe carpels four, $\frac{1}{5}$ inch diameter, woody, opening to expose the single, black, very shining seed which remains attached some time before falling.

In sholas; belonging rather to the lower limits of our area.

Nilgiris: Kotagiri, 6,600 feet. Pulneys: Shembaganur, etc. Not Kodaikanal.

Gen. Dist. Western Ghauts. Nilgiris, Anamalais, etc.

For a note on the significance of the seeds remaining on the plant see under Ternstrœmia japonica, p. 52.

TODDALIA. F.B.I. 33 IX.

Climbing or straggling woody plants, armed with prickles. Leaves of three sessile leaflets. Flowers small, in cymes or panicles, unisexual. Stamens of the male flower as many or more than the petals. Ovary of the female flower egg-shaped, entire, the carpels completely united, each with two ovules. Fruit leathery or fleshy; berry of several cells each with usually one seed.

Species 9, in the tropics of the Old World mainly of Africa.

Name taken direct from the Malayalam name kaka-toddali.

Toddalia asiatica *Lamk.* formerly T. aculeata *Pers.*; *F.B.I.* i 497, IX 1; *var.* floribunda; the Toddali. A rambling woody plant, with stem near the ground as thick as one's arm or, higher up, as one's wrist, and there studded with pyramidal lumps of cork three-quarters of an inch high. Twigs armed with curved

prickles. Leaves alternate, three-foliate: petiole 1 to $1\frac{1}{4}$ inches, with an occasional prickle: leaflets, 1 to 3 by $\frac{1}{2}$ to 1 inch, obovate cuspidate, with short blunt acumen notched at the end, coriaceous, glabrous, finely crenulate, dark green: midrib strong, lateral veins numerous, slender, parallel nearly to the margin. Flowers white, $\frac{1}{3}$ to $\frac{1}{2}$ inch across, in close axillary cymose panicles 2 to 3 inches long; unisexual. Petals oblong, thickened and incurved at the apex. Male flowers globular in bud, the petals short; stamens equal in number to the petals; ovary rudimentary. Female flowers oblong in bud, the petals longer and the ovary well formed on a low disc, with a nearly sessile stigma lobed like it. Fruit the size of a pea, with a few angular seeds. Embryo bent, enclosed in a fleshy endosperm. **t. 78.** Wight Ill. t. 66.

In sholas very common on both the Nilgiri and Pulney downs, extending even down to the plains and all over South India. Very variable in regard to the size and breadth of the leaflets: on the plains usually a low shrub with smaller and narrower leaflets.

Var. obtusifolia, an erect shrub unarmed or only slightly prickly. Leaflets obtuse. Flowers in short dense panicles.

Nilgiris: In roadside hedges near Kotagiri.

Gen. Dist. Widely over the Indian and Malayan tropics, to Java, Sumatra, China and the Phillipines.

MURRAYA.

Shrubs with rather dark foliage of alternate, pinnate leaves; the leaflets alternate, oblique or cuneate at the base. Flowers solitary or in terminal corymbs, petals 5. Stamens 10, attached outside the disc, their filaments white, thick but not much enlarged at the base. Ovary

seated on the disc, with two styles connate more or less, bearing two stigmas. Fruit an orange-coloured berry.

Named in honour of John Adam Murray, a Professor of Botany at Gottingden and editor of some of Linnaeus' works.

Murraya exotica *Linn.; F.B.I.* i 502, XIV 1. Leaflets 3, easily mistaken for distinct leaves, terminal largest. Flowers axillary 1 inch, campanulate, white and very fragrant.

Nilgiris: on eastern plateau near Biccapatti. Frequently planted in garden on the plains.

M. Kœnigii is a small tree with numerous leaflets and numerous small flowers in axillary panicles. Its leaflets are highly aromatic and used in curries.

CITRUS. F.B.I. 33 XX 1.

Spiny trees, with winged petiole having a single leaflet jointed to its end—only cultivated.

Citrus aurantiun *L.*, the Orange, hasentire leaflet.

C. decumana *Murr* the "Pumelo" or "Shaddock" has crenate leaflet.

C. Medica *L.* the "Citron" is distinguished by its hardly winged petiole very large serrate leaflet, and purple roughly pear-shaped fruit. Varieties of this species are *acida* the "lime", "*limetta*," the "sweet lime" and *limonum* the "lemon."

Citrus nobilis *Lour.* is the "Mandarin orange" or "Tangerine."

ACRONYCHIA. F.B.I. 33 X.

Trees with 1, rarely 3-foliate leaves, and small flowers in long-peduncled cymes, the parts in fours (stamens 8). Ovary not deeply lobed, fruit a four-celled drupe.

Species few, in tropical Asia, Australia and the Pacific islands.

Acronychia laurifolia *Blume; F.B.I.* i 498, X 1. Leaflet 3 to 9 inches, thick. Peduncles 3 to 6 inches, cymes as broad corymbs. Petals with white hairs inside at the base. **t. 79.** Wight Ill. r. 65.

Nilgiris: Coonoor on roadsides, not above. Pulneys: Shembaganur, etc.

MELIACEÆ.

Trees with pinnate or bi-pinnate leaves and rather small flowers in large axillary panicles, characterized by the stamens being united into a tube bearing the anthers sessile in the inner side. Fruit a drupe.

Species about 400 mostly in the tropics of both hemispheres, and especially in the Indian Archipelago. Common trees of the plains are Azadirachta indica *A. Juss*, (Melia azadirachta *L.*), the Neem or Margosa; Melia azedarach *L.*, the Persian Lilac; Chloroxylon swietenia *DC.*, the Satin Wood or White Cedar; Cedrela Toona *Roxb.* Swietenia Mahagoni *L.*, Mahogany, a native of the West Indies, is planted in gardens.

KEY TO THE GENERA.

a { Filaments of stamens broad at least at the base and connected; bifid at tip. . . . . *b*
Filament free, subulate: leaves 2 to 3 feet long; leaflets many, 2 to 7 inches long. A tall tree . . CEDRELA.

b { Fruit a small drupe; shrub . . . . . . CIPADESSA.
Fruit a capsule, seeds with aril; a tree . . . HEYNEA.

Cipadessa baccifera *Miq.; F.B.I.* i 545 as C. fruticosa B 1; V 1. A well-branched shrub. Leaves alternate imparipinnate, leaflets 9 or 11, the basal ones smaller than the terminal, opposite, more or less ovate, entire or

coarsely toothed in the distal half, glabrous. Flowers? ¼ inch, in irregular axillary panicles, the branches of which are towards the end (i.e., unbranched part of peduncle long) the whole shorter than the leaves. Sepals small. Petals ⅛ inch, lanceolate or narrow triangular, spreading pubescent on the backs. Stamens erect, nearly as long and broad as the petals, united at the base only, bifid at the tips, with small anthers on the inner face. Ovary globose ; style swollen above and extended into a point above the ring-shaped stigma. Fruit a small drupe, under ¼ inch, red, with very thin flesh through which the five division show ; and one or two seeds in each chamber.

Shevaroys : roadsides about Yercaud.

Gen. Dist. Low hills of South India especially on laterite.

HEYNEA. F.B.I. 37 XIII.

Trees. Leaflets opposite, with one terminal, quite entire. Panicles terminal and axillary, on long peduncles. Flowers small. Stamens connate into a tube, with two teeth to each on either side of the anther. Stigma thickened at the base, two to three cleft at top. Fruit one-celled, seeds surrounded with fleshy aril.

Species very few in India and adjacent islands.

Heynea trijuga *Roxb.; F.B.I.* i 565, XIII I. A small or large tree. Leaflets ovate-oblong or lanceolate, acuminate, glabrous above. Flowers in corymbose panicles standing above the leaves, small, pale cream in colour, with bright orange-yellow stamens massed in the centre. Fruit round, opening in two valves, with one seed. t. 80. Bedd. Fl. Syl. t. lxxxiv ; Curt. Bot. Mag. t. 1738.

Nilgiris : Coonoor, on roadsides and at lower level, common. Shevaroys : Yercaud and below.

Gen. Dist. Eastern and Western Ghauts, to 6,000 feet, forests of Oudh, and the Himalaya, Khasia Mountains and southwards to Penang.

CEDRELA. F.B.I. 37 XVIII.

Cedrela Toona *Roxb. ; F.B.I.* i 568, XVIII 1. A handsome tree, with large pinnate leaves and small white flowers in large axillary well-branched panicles. Leaves 2 to 3 feet ; leaflets glossy ; ovate acute 2 to 6 inches long. Panicles 1 foot or more. Calyx $\frac{1}{16}$ inch. Corolla $\frac{1}{4}$ inch. Filaments of stamens broad below but narrow in upper half, not bifid or toothed. Fruit an oblong capsule 1 to $1\frac{1}{2}$ inches with winged seeds.

Nilgiris : wild or planted, here and there on the Eastern plateau, Kotagiri, Coonoor.

Gen. Dist. Lower South Indian hills.

Wood red, soft and scented, used for cigar boxes.

ICACINACEÆ.

Trees and shrubs with alternate entire leaves ; flowers in compound panicles, with lobed calyx, four or five petals and stamens, and one cell only to the ovary, in which are two ovules pendent from the top of the cell, with their micropyles pointing inwards and upwards ; fruit usually a drupe.

Species about 200, chiefly tropical.

KEY TO THE GENERA.

a { Flowers in large terminal cymose corymbs. Anthers oblong, embryo large ; flowers often fœtid . . MAPPIA.
  { Flowers axillary, few ; petals lightly united. GOMPHANDRA.

MAPPIA. F.B.I. 39 XV.

Trees distinguished in the shola by their rather flaccid, usually drooping, broad leaves, and terminal corymbs of small white evil smelling flowers or red drupes.

The genus is a small one of about seven species, in Asia and tropical America.

Branches angular with large leaf-scars. Leaves 5 by 3 to 12 by 7 inches on the same branch, alternate, shortly petioled, broadly ovate or obovate, abruptly acuminate, entire, sparingly hairy on both sides, especially on the nerves ; standing erect when young and folded along the midrib, later on laxly spreading : nerves about six pairs, rather straight and closer towards the base : stalk $\frac{1}{4}$ inch. Flowers in terminal cymose panicles, white ; buds very hairy. Calyx small. Petals five, free or slightly united, hairy inside, about $\frac{1}{8}$ inch long. Stamens five, free of the petals, with slender filaments. Ovary superior, one-celled. Fruit a drupe, $\frac{1}{3}$ to $\frac{5}{8}$ inch long, purple. Seed in the stone pendent. **t. 81.** Wight Ic. 955.

Common shola trees. Nilgiris : on both the Western and the Eastern plateau. Pulneys : on the downs.

Gen. Dist. Western Ghauts and Mysore.

Three species are distinguished by Miers and in F.M.P. are given as occurring here, but our trees appear to me to grade into each other.

Leaves thick, very tomentose on lower side. M. tomentosa.
Leaves thin, hairy or not. Flowers fœtid. . . M. fœtida.
do. Flowers not fœtid. . M. ovata.

Trees standing alongside each other and otherwise indistinguishable will be found with leaves 3 inches long and fruits $\frac{5}{8}$ inch, or leaves 7 inches long and fruits $\frac{1}{3}$ inch.

GOMPHANDRA. F.B.I. XXXIX.

A small genus of under ten species, natives of tropical Asia.

Gomphandra coriacea *Wt.; F.B.I.* i 586 in part. A small tree or shrub with young branches, and both sides of leaves, all equally green. Leaves variable, elliptic, or obovate, glabrous, about 2 by 1 inch. Flowers solitary or in few-flowered cymes, peduncled often opposite, greenish white; the leaves pleasantly scented. Calyx minute. Petals erect, $\frac{1}{6}$ inch, irregularly connate into a tube, tips inflexed. Stamens with very thick filaments and small anthers pendulous from the inside. Ovary oblong as long as the filaments, surmounted by the large lobed stigma, without style. Fruit pale clear yellow, about 2 inches long, with the five-angled stigma $\frac{1}{8}$ inch wide at the top. Stone with wrinkled skin. Seed with raphe completely round from top to bottom. **t. 82.** Wt. Ic. 953, 954.

Nilgiris: on the outskirts of heavy sholas, 3,000 to 6,000 feet, Coonoor, Kodanad, etc. Pulneys at Kodaikanal and below.

Gen. Dist. Western Ghauts.

AQUIFOLIACEÆ.

(*formerly* ILICINEÆ).

ILEX. F.B.I. 40 I.

Practically the only genus of the family, having 150 or more species, the other genera with one or two only.

Trees with erect or spreading, simple alternate glossy leaves, entire or toothed and small white, in short cymes or umbels at the leaf-axils, not in showy inflorescences; the sexes usually on separate trees (diœcious). Sepals small.

Petals four to five even in the same cyme, sometimes united at the base. Stamens on the male trees of the same number. Ovary on the female trees with short thick style, and of four cells, each with one ovule only, hanging from the top corner with its micropyle facing inwards and upwards, with a thickened funicle. Fruit a drupe with two or more small stones.

Distributed in the tropics chiefly of Central and South America, Asia, Africa, Australia ; and one species, the common Holly, in Europe.

Name from the Celtic AC *or* OC *signifying a point because of the prickly leaves of the European species the Holly.*

KEY TO THE SPECIES.

a	Leaves toothed. Large tree	I. denticulata.
	Leaves entire	*b*
b	Leaves elliptic narrowed at base. Tree .	I. Wightiana.
	Leaves ovate, rounded at base. Shrub	I. Gardneriana.

Ilex denticulata *Wall. ; F.B.I.* i 600, I 7. A tree, often very large with thick spreading branches. Leaves $2\frac{1}{2}$ to 3 inches, elliptic or elliptic-oblong, acute or obtusely acuminate, serrate when mature, thick and very tough when dry. Male flowers in small branched cymose panicles up to $\frac{3}{4}$ inch long, in the leaf-axils, with minute bracts. Petals white, round, $\frac{1}{8}$ inch across. Stamens as many, with very short filament and thick anther, $\frac{1}{20}$ inch. Female flowers pedicelled in axillary fascicles. Petals free. Stamens often with long filaments persistent till the fruit is ripe, their anthers (?) sterile. Ovary four-celled. Fruit the size of a pea, with four stones. t. 83. Wight Ill. t. 142.

In sholas quite common especially on the Nilgiri downs from Ootacamund to Pykara.

Gen. Dist. South India and Ceylon.

Ilex Wightiana *Wall.* ; *F.B.I.* i 603, I 16. Flowering as a small but growing to a very large tree, with branches numerous and sloping steeply upwards ; bark grey, lenticelled. Leaves 2 by 1 inch or less, elliptic, acute or not, narrowed at the base entire or with a few small teeth near the end ; stalks reddish, and young blades red and erect. Flowers white, $\frac{1}{8}$ to $\frac{1}{6}$ inch across fascicled or in peduncled cymes or compound cymes ; sometimes few only, sometimes many together ; peduncles and pedicels $\frac{1}{8}$ inch, red. Petals four to six, obtuse, united at the base. Stamens in the male flowers attached to the base of the corolla, anthers heart-shaped, filaments stiff and thickened at the base. Fruit the size of a small pea. **t. 84.** Wight Ic. 1216.

Very common both in sholas and in the open. Nilgiris : in Ootacamund itself in many gardens. Pykara, on the open hill-sides as small rounded trees, 10 to 15 feet high, and the commonest tree in every little stream all over the downs to Pykara, Avalanche and Sispara. Pulneys : in sholas, sometimes as very large trees.

Gen. Dist. South Indian hills.

Ilex Gardneriana *Wt.* ; *F.B.I.* i 603, I 15. A shrub or small tree. Leaves ovate-lanceolate, acuminate, 2 to 3 inches, with rounded base. Flowers on stalks of $\frac{1}{4}$ inch in solitary or fascicled umbels on peduncles of $\frac{1}{2}$ inch. Sepals and petals 5. Wt. Ic. 1217.

Nilgiris : Sispara, 6,000 feet (*Wight*).

CELASTRACEÆ.

Shrubs and trees with opposite or alternate simple leaves ; small greenish or purplish brown perfectly regular flowers, yellowish or in some kind of cymose inflorescence, and two erect ovules to each cell of the ovary. There is usually, but not always, a well-marked

disc round and above the ovary on which the stamens are borne; and there is usually also an aril, often brilliantly coloured, on the seed.

Species about 300 in the warmer parts of Europe, North America and Asia.

KEY TO THE GENERA.

a	Leaves alternate	b
	Leaves opposite	c
b	Tree. Flrs. in axillary dichotomous cymes.	GYMNOSPORIA.
	Large climber. Flowers in drooping panicle.	CELASTRUS.
c	Leaves stiffly erect; flowers yellowish, without disc; capsule two-valved; seed one only without aril.	MICROTROPIS.
	Leaves spreading; flowers brownish purple, three or seven on slender axillary peduncles; disc well marked; capsule red, five-valved; seeds five with red or orange aril	EUONYMUS.

EUONYMUS. F.B.I. 41 I.

Spindle-tree.

Small trees and shrubs with opposite simple leaves and flowers in peduncled cymes with large disc covering the ovary, but chiefly distinguished by the angular or winged pear-shaped capsule from which after dehiscence hang the brilliantly coloured seeds with their large red or orange arils.

Species about sixty, mostly in India, especially on the Himalayas. Malaya has four or five, the Phillipines two, Australia, North America and Europe one each. The last is the Spindle tree of England. *Fr.* Fusain. *Ger.* Spindlebaum.

Euonymus crenulatus *Wallich, ex Wight and Arnott, Prod.* 161, *omitting Wall. Cat.* 4409, *Herb. Wight. Prop.* 482 *! ; F.B.I* i 608, I 4; the Spindle-tree. A small tree or shrub with rather loosely spreading branched and yellowish green leaves more or less horizontal so that the

foliage is in flat tiers and light. Year's shoots four-angled, not or slightly lenticelled. Leaves shortly petioled, elliptic, or occasionally ovate, entire or obscurely serrate towards the top, quite glabrous ; margins revolute, midrib strong but nerves obscure. Flowers in small cymes or cymose panicles of three or seven, on slender peduncles 1 inch long, often in pairs in the upper leaf-axils. Bracts and bracteoles minute ; pedicels $\frac{1}{8}$ inch ; buds globular $\frac{1}{8}$ inch. Sepals rounded. Petals $\frac{1}{6}$ inch, rounded, purplish brown, surrounding the thick fleshy disc on which stand the four or five stamens with broad anthers. Ovary sunk in the disc with short thick style, of five cells each with two ovules hanging from the upper corner. Fruit a brilliantly crimson pear-shaped capsule (with the dried calyx as a ring at its base), opening so as to allow the five or more orange-coloured seeds, each capped by a large orange red aril, to hang down on slender but firm stalks, where they remain some time attached to the valves, against whose silvery white inner surfaces they are very conspicuous. **t. 85.** Wight Ic. t. 973.

In sholas everywhere on both plateaus, quite common ; on the Nilgiris especially near Pykara.

Gen. Dist. South Indian hills.

The wood of this genus is usually hard and can be put to a variety of uses ; that of our species and several others is, according to Colonel Beddome, one of the best substitutes for Boxwood. The red aril on the seeds is said to be used in some parts of India by women to mark their foreheads. For a note on the persistence on their capsules of brilliantly coloured seeds see Ternstrœmia japonica *Thunb*, p. 52, and compare Polygala arillata.

MICROTOPIS. F.B.I. 41 III.

Trees with simple opposite leaves conspicuously erect, with revolute margins ; flowers in terminal much-branched cymose corymbs or in dense clusters on the

thick branches ; petals united at the base ; disc reduced to a ring or absent altogether ; ovary with two ovules in each cell ; fruit a capsule with only one seed, and opening in two valves ; seed without aril.

Species 10 on the mountains of India, Ceylon, the Malay Peninsula and Java.

The three or four species which occur here are in respect of the absence of an aril to the seed and often too of any disc to the flower not typical of the family.

KEY TO THE SPECIES.

a	Flowers sessile in dense clusters in axils of fallen leaves.	*b*
	Flowers in terminal and axillary corymbs	*c*
b	Leaves stiffly erect, notched or rounded at apex.	M. ramiflora.
	Leaves acuminate (Sispara and below) . .	M. latifolia.
c	Petals rounded, not clawed. Seed brown.	M. microcarpa.
	Petals clawed. Seed crimson	M. ovalifolia.

Microtropis ramiflora *Wight ; F.B.I.* i 613, Ill 3. Distinguished from all others of the order and from, practically all other trees by the dense clumps of small stalkless flowers along the rather thick branchlets ; and among trees in general remarkable for its very stiff, nearly erect dark green oval leaves with margins curled back.

A medium-sized tree with thick branches and smooth dark purple twigs. Leaves 1 to 4 by $\frac{3}{4}$ to 3 inches, broadly elliptic or obovate, coriaceous, quite glabrous ; Flowers honey-scented ; Sepals imbricate, rounded, with scarious broken margin. Petals $\frac{1}{8}$ inch, broadly obovate, spreading.* Fruit an ovoid capsule, $\frac{5}{8}$ inch long, brown opening by two valves which fall off before the seed. Seed one only, red, without aril, erect ; cotyledons leafy, orbicular, flat ; radicle pointing downwards. t. 86. Wight Ic. t. 977.

* F.B.I. in description of genus says petals erect.

Nilgiris : in the sholas of the plateau, frequent. Pulneys : on the downs above and around Kodaikanal and below.

Gen. Dist. Also in Ceylon.

In t. 62 : *l.* bud from above ; *c.* corolla opened showing the stamens on the annular disc ; *d.* a closed, faded flower ; *e.* section of flower ; *c.* calyx tube ; *s.* sepal ; *p.* petal ; *d.* disc ; *o.* section of ovary ; *d.* above a cluster of fruits, one open and showing the solitary seed ; *f.* seed with aborted ovule and carpels at the base.

Microtropis microcarpa *Wight ; F.B.I.* i 614, III 5. Shrub or small tree with the stiffly erect leaves of a MICROTROPIS, but the slender peduncles of a EUONYMUS. Tree up to 20 feet with ascending branches. Foliage bluish green ; leaves elliptic or broadly lanceolate, 1 to 2 inches by $\frac{3}{4}$ to $1\frac{1}{4}$ inch, quite glabrous, coriaceous ; obtuse and notched : margin revolute ; stalk $\frac{1}{8}$ inch. Flowers in cymose corymbs, peduncled in the leaf-axils. Sepals two to four, scarious persistent. No disc. Petals round. Style with four-notched stigma. Fruit oblong ; $\frac{1}{2}$ by $\frac{1}{5}$ inch, asymmetric, the small stylar point to one side of the top. Seed rusty-brown. Wight Ic. **t.** 975.

Nilgiris : Elk Hill and eastwards to Kotagiri, etc. ; flower April. Pulneys.

Gen. Dist. Western Peninsula, Mysore, Concan.

Microtropis ovalifolia *Wight ; F.B.I.* i 614, III 6. A shrub. Leaves larger, 2 to 3 inches, elliptic, glossy and with recurved margin. Flowers in cymose panicles on axillary or terminal peduncles ; buds and fading flowers $\frac{1}{8}$ inch egg-shaped or obconic ; petals clawed. Fruit $\frac{1}{2}$ by $\frac{1}{5}$ inch, seated on the slightly enlarged calyx, brown, warty, and containing one crimson seed. **t. 87.**

Nilgiris : Coonoor, Pykara, and on the western side near streams.

CELASTRUS. F.B.I. 41 VII.

Climbing shrubs with alternate leaves and panicles of small flowers, of the family type; characterized by the ovary being free of, or but half immersed in, the disc; the stamens inserted on the margin of the disc; style with three-lobed stigma; fruit a dehiscent capsule. Seed with aril, and with erect embryo radicle pointing downwards.

Species 40 in Asia, Australia, Polynesia and North America.

The name is of Greek origin and connected with the word KEELAS *meaning the latter part of the year, because the seeds ripened rather late on in the autumn and hung some time on the tree. But the Greek* KELASTROS *was probably a* EUONYMUS.

Celastrus paniculata *Willd.; F.B.I.* i 617, VII 1. A large woody climber or straggler over trees. The numerous short leafy shoots of the current year rising each from a cup or swelling marking the bud scales, and covered with shiny grey bark studded with numerous pale lenticels, ending in drooping panicles of small yellowish flowers. Leaves alternate, oblong-elliptic, nearly circular or obovate, usually cuspidate, finally crenate (the teeth $\frac{1}{16}$ inch apart about) from near the base to the apex, in length about 3 inches (1 to 4), with five or six main pairs of nerves arching from the midrib. Pedicels $\frac{1}{16}$ inch, with minute bract and bracteoles at the base. Calyx $\frac{1}{16}$ inch deep, sepals rounded, imbricate. Petals $\frac{1}{10}$ inch, yellowish-green, surrounding a cup-like disc which is clear of the ovary. Filaments of stamens short; anthers as long. Ovary three-celled: style very short. Fruit the size of a pea, on a slender pedicel $\frac{1}{4}$ inch or more, when ripe of a brilliant orange colour opening loculicidally in three roundish shortly pointed valves which

break away from the axis, each with one brown seed imbedded in a red fleshy aril. **t. 88.** Wight Ill. t. 72.

In sholas, commoner at lower levels. Pulneys : near Kodaikanal, Bearshola, etc., and below. Nilgiris : Kotagiri and below.

Gen. Dist. Hilly districts of India—Mysore, Wynaad, etc., Ceylon, Malay Archipelago and the Phillipines.

GYMNOSPORIA. F.B.I. 41 VIII.

Trees with alternate leaves, and dichotomous axillary cymes of small flowers. Fruit a globose or obovoid, often angular, capsule with one or two arillate seeds in each cell ; the walls hard and stiff and splitting (loculicidally) down the back of each carpel and also away from the central (placental) axis.

Species about 60 in the hotter parts of the world.

Gymnosporia ovata *Lawson ; F.B.I.* i 619, VIII 7. A shrub ; no thorns. Leaves ovate rounded or cordate at base, finely crenate, about two inches long, very hard and thick, drying dark green or blackish. Flowers very small, in dense fascicles of ½ to 1½ inches, on short peduncles. Fruit ½ inch, broadly obovate, three-celled ; seed with aril only at the base. **t. 89.**

Nilgiris : on the eastern plateau at Kodanad, etc. Pulneys : Poombarai, etc. Shevaroys : Honey Rock.

Gymnosporia Heyneana *W. & A. ; F.B.I.* 1620, VIII 10. A spiny tree. Leaves twice as long as broad cuneate at the base serrate. Cymes up to 4 inches, and flowers larger than in G. ovata. Capsule ½ inch pink turning brown as it opens. Seed with fleshy crenulat e aril at base only.

Nilgiris : below Kodanad. Shevaroys : near Yercaud and on " Green Hills."

RHAMNACEÆ.

The chief distinguishing characteristic of this family is the arrangement of the stamens, for being equal in number to the petals they stand not between them, as in all other families with isomerous stamens (except that of the Grape-vine) but opposite, that is, alternately with the sepals.

Plants all woody, either shrubs or small trees, never herbs. Leaves nearly always alternate, but sometimes approximate in pairs or even quite opposite: simple, shortly stalked and finely toothed, glabrous on the upper side, and usually all in one plane, facing upwards.

Flowers small and greenish, with yellow centres (disc); in cymes, fascicles, or small umbels at the leaf-axils. Sepals and petals either five or four. Stamens as many, quite short, and in some genera covered by the spoon-shaped petals. Ovary of two (or three) cells surrounded by or imbedded in the yellow disc. The nature of the disc, whether it completely fills the calyx cup, and so covers the ovary, or is only a saucer-shaped lining to it is used to class the genera in their "tribes." Fruit fleshy, with one to three stones, quite free from the rest of the flower or girt up to its middle by the calyx tube (i.e., partly inferior).

Species 500, in all parts of the world, wherever trees grow. In Europe the common and the Alder-Buckthorn, Rhamnus cathartica *L.* and *R.* frangula *L.* *Ger.* Wegdorn, are wild. *R.* alaternus, and various species of Ceanotus and Pomaderris are common in English gardens.

KEY TO THE GENERA.

a	Flowers egg-shaped, very woolly . . .	POMADERRIS.
	Flowers flat, not woolly	*b*

b { Leaves opposite or nearly so . . . . SCUTIA.
  { Leaves distinctly alternate c

c { Thorns stipular, curved; main veins 3 to 5 at base, branched above . . . . ZIZYPHUS.
  { Branches spiny or not; main vein single at base, pinnate. RHAMNUS.

ZIZYPHUS. F.B.I. 42 III.

Trees and shrubs, with alternate leaves and often the stipules modified as curved or straight prickles. Flowers fascicled in the axils, or in sessile or peduncled cymes. Disc completely filling the calyx so that the receptacle is flat. Fruit fleshy with hard stone. Stamens erect not enclosed in petals.

In most (all ?) species the leaf has three main veins starting from the base. The midrib gives off short lateral veins pinnately; the other two main veins curve outwards and then inwards to meet at the tip and give off conspicuous veins on the outer side, but hardly any inwards. The whole venation is so peculiar as almost to suffice to identify the genus, but some English species of Rhamnus are very similar.

Species about 50, in tropical Asia and America, and in temperate regions.

On the plains there are several species, quite common.

Zizyphus rugosa *Lamk.; F.B.I.* i 36, III 147. A large straggling shrub, armed with solitary curved and formidable prickles. Leaves 2 to 4 inches, elliptic, glabrous on the upper densely tomentose on the lower side as also the young twigs. Flowers greenish yellow, in peduncled cymes near the ends of leafless branches, forming large panicles. Fruit fleshy, small with one stone and one seed. **t. 90.**

Nilgiris: in dry thickets Eastern plateau, 6,500 feet, Ghaut Road just below Coonoor, etc. Pulneys: Poombarai and on Ghauts to 6,000 feet.

Gen. Dist. Common in dry deciduous forests on the Western Ghauts to 6,000 feet.

Zizyphus incurva *Roxb.*; *F.B.I.* i 635, III 12. A large tree up to 50 feet high, quite glabrous except for a brown pubescence on the young parts, petioles and main veins the stouter and non-flowering branches with slender stipular spines, up to 1 inch long on a broad base. Leaves obliquely ovate, about 3 by 2 inches, finely crenate-serrate membranous: veins 3 at the base much raised on the underside, and impressed on the upper: veinlets from the outer pair joined in loops: base of leaf truncate or almost cordate and decurrent on the short $\frac{1}{4}$ inch petiole. Flowers in axillary cymes, the peduncle longer than the petiole and pedicel about $\frac{1}{4}$ inch. Disc rich yellow, ten-lobed, with a pit behind each lobe. Style of two short branches. Fruit $\frac{1}{3}$ inch, globose or obovoid, seated on the hardly enlarged calyx with one seed covered only by a thin flesh.

Nilgiris: Fernhill, flowering September.

Apparently wild though perhaps introduced from its home in northern India. *F.B.I.* gives it as occurring on these hills, but *G.F.M.P.* does not include the species in the Madras Flora.

RHAMNUS. F.B.I. 42 V.

Buckthorn, etc.

Shrubs and trees with alternate penninerved leaves and small greenish flowers fascicled in the leaf-axils; characterized by the disc being only a thin lining to the hollowed receptacle (not filling it), and the fruit a berry-like drupe, girt at the base by the remains of the calyx. Petals small, spoon-shaped, enclosing the stamens.

Species about 70, in temperate climates of the northern hemisphere.

Name said to have been taken from the Celtic word RAM *meaning a tuft of branches, in allusion to the habit of the Buckthorn the common European species.*

KEY TO THE SPECIES.

Branches ending in spines : leaves tufted on short spurs ; floral parts in fours. Shrubs or trees usually in the open.
R. virgatus.

No spines : leaves all scattered, dark dull green ; parts of the flower in fives. Shrubs or trees very common in woods.
R. Wightii.

Rhamnus virgatus *Roxburgh ; F.B.I.* as R. dahuricus *Pall.* i 639, V 3 ; the Indian Buckthorn. In dry places a very spiny, stunted shrub, with tufts of small, finely toothed leaves, and white, thin, smooth bark. Shoots of two kinds—(i) ordinary branches 1½ to 6 inches long, with leaves, or more usually leaf-scars, at intervals of ¼ to ½ inch, and (ii) very short shoots (spurs) from the axils of the leaf-scars on (i) barely ¼ inch long, crowded with bud-scars and ending in a tuft of leaves. Leaves ½ to 1½ inches or up to 3 inches in moist places, ovate-acute, a little oblique, finely serrate from near the base to the tip, with usually two veins on either side of the midrib, starting from below the middle. Flowers numerous, on slender pedicels of ¼ inch, fascicled in the leaf-axils. Sepals four, narrow acute. Ovary two-celled with two styles. Fruit ⅕ inch. Seeds plano-convex with a deep furrow on the outer side (Bedd.). **t. 91.**

A spur (ii) may continue as such for several seasons, or in another year lengthen into a branch of the first kind, and perhaps all the latter start as spurs, for they have usually crowded leaf-scars at the base. The combination of leafless spine-tipped branches and leafy spurs is very characteristic. Since

the formation of a spine of necessity terminates the growth of a branch and further extension can be only by a lateral shoot, the spines frequently appear in the forks of the branch system.

In t. 91 : *b.* flower as seen from above showing the four long sepals ; *c.* flower in section through two opposite sepals ; *d.* the same through two opposite petals, sepals not shown ; *e.* stamen and petal in position as in the flower ; *f.* stamen and petal separated.

Nilgiris : between Kotagiri and Coonoor. Pulneys : not very common.

Gen. Dist. Tinnevelly Hills and Western Ghauts. Punjab, Temperate Himalaya from Simla to Bhotan, and on to China and Japan.

A close ally of R. catharticus L., the common Buckthorn of England, *Fr.* Nerprum medicanal, *Ger.* Kreuzdorn. Also of R. dahuricus *Pall.* of northern Asia which however is not the same plant.

Rhamnus Wightii *Wight and Arnott ; Wight Herb. Prop.* 507 *! ; F.B.I.* i 639, V 4. A shola shrub or tree, growing on the Kodaikanal downs to a height of 50 feet with branches 15 inches thick at 15 feet from the ground ; twigs dark green and like all the other parts glabrous. Leaves 3 to 5 inches long, elliptic or oblong, shortly acuminate, finely serrate, when dry black. Flowers in fascicles in the leaf-axils ; pedicels shorter than the petioles ; floral parts in fives. Sepals triangular. Petals flat. Styles three. Disc thin. Fruit $\frac{1}{5}$ inch, purple, set on the half-cup-shaped expansion of the pedicel (calyx tube). **t. 92.** Wight Ic. 159.

Very common in sholas near Ootacamund and everywhere on the Nilgiri and Pulney downs. The short flowering branches are often arranged in large terminal panicles. Flowers April to September.

Gen. Dist. Western Ghauts and Ceylon, at high elevations only.

SCUTIA. F.B.I. 42 VII.

Shrubs with opposite or sub-opposite leaves and axillary fascicles of small flowers, in which the disc fills the

calyx tube. Fruit half superior, surrounded at the base by the calyx tube.

Species about 10, in Asia, Africa and tropical America.

Scutia myrtina *Kurz ; F.B.I.* i 842, VII. A straggling shrub. Leaves opposite or sub-opposite, about 1 inch, round or obovate, coriaceous, shining, penni-nerved. Flower white. Sepals with prominent incurved tip. Petals rounded, two-lobed, wrapping round the violet anthers. Stigma bi-globose. Fruit ¼ inch purple, with a small violet stylar point in the slightly depressed apex, and seated obliquely on the saucer-shaped calyx. **t. 93.**

Nilgiris ; on the Eastern plateau near Kotagiri, Biccapatti, etc., at 5,000 to 6,000 feet. Flowering April.

Gen. Dist. In dry deciduous and scrub forest, in Northern Circars, Deccan and Carnatic. Eastern slopes of Western Ghauts.

POMADERRIS. 42 IX.

An Australian genus, one species introduced here, peculiar in its egg-shaped calyx tube and comparatively long flat petals.

Species 20, of which 18 in south and south-east Australia and 2 in New Zealand.

Named from POMA, *a lid, and* DERRIS, *skin.*

Pomaderris lanigera *Sims,* Bot. Mag. t. 1823. A shrub with softly woolly branches, thick lanceolate leaves very tomentose below, and wide terminal panicles of long stalked very woolly flowers. Calyx tube lined up to the acute sepals by the thin disc, very woolly. Petals as long, obovate clawed. Stamens half as long again : anthers large. Ovary three-celled : style three-branched. Fruit of three bony cocci, which separate from

the central axis dehiscing at the inner angle: embryo flat, radicle pointing downwards. **t. 94.**

Only where planted.

The stamens move one at a time from the petals to which each is at first attached towards the style and shed pollen on the stigma. A good instance of a special mechanism for ensuring self-pollination.

VITACEÆ.

VITIS *Linn.* F.B.I. 43 I.

Grape-vine.

The vines are slender woody plants which climb up trees by the help of tendrils placed opposite some of the leaves. Their flowers are small and in much branched panicles also placed opposite leaves, and are distinguished from those of almost all other families, except the RHAMNEÆ, by the stamens being opposite not alternate to the petals. The fruit is a berry with three or four seeds.

For the morphology of the tendrils and the flowering parts, and the reason of their position opposite the leaves reference may be made to any text-book of Botany.

Named from the Greek AMPELOS, *vine, and* OPSIS, *resemblance, because like a vine.*

The old genus VITIS of Linnaeus has been split up into a number of genera distinguished chiefly by details of the petals and stigma, characters not always easy to determine. Of these genera we have four represented, and they may be distinguished here as follows:—

Leaflets 3 only, panicle of flowers only, petals 5, seeds smooth. PARTHENOCISSUS.

Leaflets 3, a tendril from a branch of the panicle. Flowers red AMPELOCISSUS.

Leaflets 3 or 5, pedate; petals 4; stigma four-lobed. TETRASTIGMA.

Leaflets 7 or 9, pedate; stigma obscure. . . CAYRATIA.

TETRASTIGMA.

Climbers with simple or forked tendrils, leaves usually five-foliate, pedate, but also with 3 or 1 leaflet only. Flowers polygamo-diœcious. Petals 4, spreading. Stigma four-lobed. Seeds globose with two furrows on face and a prominent chalaza on the back.

Tetrastigma muricatum *Gamble ; F.B.I.* i 660, as **Vitis lanceolaria** in Part I, 64. Stem warty. Leaves usually three-foliate, sometimes with five leaflets ; leaflets acute, glabrous, serrate. Seeds pyriform with shallow grooves on the face and oblong chalaza. **t. 95**. Wt. Ic. 177.

Nilgiri and Pulney Hills, below 6,000 feet common.

Gen. Dist. Western Ghauts.

PARTHENOCISSUS.

Climbing shrubs with much-branched tendrils opposite the leaves, which attach themselves by discs. Leaves three-foliate. Petals 5. Seed globose with narrow raphe half round it.

Parthenocissus neilgherriensis *Planchuon* ; formerly Vitis anamalayana *Bedd. Herb ! ; F.B.I.* i 656, I 45.

Branchlets quite glabrous, younger smooth, older with a few minute lenticels. Leaves on the young shoots simple, in older three-foliate, stalk 1 to 8 inches. Leaflets pubescent on the nerves of the under side, elliptic or obovate, sharply serrate (teeth $\frac{1}{4}$ to $\frac{1}{2}$ inch apart), with long acumen of about 1 inch ; the lateral ones very oblique and broader on the outer margin : conspicuously reticulate below. Tendrils branched and bearing small bracts opposite the branches. Flowers in loose cymose panicles, calyx small, five-lobed. Petals four or five,

oblong, with incurved tip, bent right back when open. Disc fused to the ovary and hardly distinguishable except by colour and the secretion of honey. Ovary very thick with short stumpy style and minute stigma. **t. 96**.

In sholas. Pulneys: on the Kodaikanal downs and below. Nilgiris: apparently only on the edge of our area and below. Anamalais.

In F.B.I. i 655-6 the Nilgiri and Pulney Anamallai plants (Wight Ic. t. 965) are given under V. himalayana *Brand*, a Kashmir species.

AMPELOCISSUS.

Vines with leaf-opposed stalked panicles of flowers containing a sterile branch developed as a tendril. Leaves simple and lobed or of three leaflets. Flowers in our species red.

Ampelocissus araneosa *Planch.*; *F.B.I.* i 657 as Vitis araneosa *Lawson*, I 51. Leaflets 3 ovate acute, irregularly serrate, densely white tomentose underneath, with about 4 pairs of rather straight main veins from the midrib: the lateral leaflets very oblique in shape. Flowers small in crowded cymes, 1 inch across. Petals 5, a rich red-brown, curled back after opening and soon falling. Stamens a little longer than the petals, red: anthers yellow. Disc embracing base of ovary, finely fluted. Ovary broadly conical, stigma a mere point. Berry ½ inch.

Shevaroys: on Green Hills. Nilgiri and Pulneys at low levels.

CAYRATIA.

Climbing shrubs with tendrils opposite the leaves. Calyx without lobes but flowers in axillary cymose corymbs

all bisexual. Petals 4, valvate. Seeds two-grooved, slightly angular, or endosperm T-shaped.

Cayratia pedata *Juss ; F.B.I.* i 661 as Vitis pedata Vahl, I 69. A large climber, with cylindrical hirsute branches. Leaflets five or seven, 4 to 8 by 1½ to 3 inches, oblong lanceolate, acuminate, serrate densely tomentose on lower side. Main petiole 3 to 6 inches, secondary ⅓ to ½ inch and those of individual leaflets ¼ inch. Flowers in widely branching corymbose cymes, yellowish or green. Fruit globose, white. Seeds ⅛ inch semi-hemispherical, hollowed out on the flat side and the opening close by a membrane.

Nilgiri and Pulney Hills below 6,000 feet.

Gen. Dist. Bengal, Silhet, Khasia and to Burma and Singapore, and down the Western Ghauts.

Var. glabra *Gamble* a weaker climber. Stem hirsute but leaves quite glabrous except on the veins underneath ; minutely rugose on the upper side. Petiole about 3 inches. Petals ⅛ inch reflexed soon falling, leaving a conspicuous wavey, tubular, at first yellow later white, disc outside the disc proper. Stamens also very fugitive, anthers large. Stigma a mere point. Berry bilobed. **t. 97**. Kodanad.

STAPHYLEACEÆ.

A small family formerly considered part of the SAPINDACEÆ now separated, and represented here by our genus only.

TURPINIA. F.B.I. 44 XXIII.

Glabrous trees with opposite shining odd-pinnate leaves and panicles of small regular flowers with five sepals, five petals, five stamens and ovary of three carpels ; characterized and distinguished from the Sapindaceæ by the cup-shaped crenulate five-partite disc *inside* the

ring of five stamens ; by the arrangement of the seeds in more than one row in each cell of the ovary, erect with ventral raphe or hanging with dorsal, and by the very hard seed coat and straight embryo.

Species 10, widely distributed over the northern tropics of Asia and America, but not known south of the Line nor in Africa.

Named in honour of M. Turpin, a French botanical artist and naturalist.

Turpinia nepalensis *Wall ; F.B.I.* i 698, XXIII 1 as Turpinia pomifera *DC.* A shola tree with rather dark drooping foliage and axillary panicles of small pale yellow flowers, and small berries marked at the top with three fine lines and containing a few very hard and smooth round seeds. Twigs round, smooth. Leaves opposite, the pair joined by a line above their insertion : leaflets three or five, occasionally seven, their stalks about $\frac{1}{4}$ inch, the terminal stalk much longer, all with a pair of minute stipels and very variable in size, from 2 to 8 in.; more or less crenate-serrate, glabrous, usually somewhat drooping and folded upwards along the midrib. Branches of the panicle opposite, and repeatedly branched, with small bracts. Stamens with filaments broader at the base, and dull brown anthers. Ovary three-lobed, with three, easily separable, styles. Fruit $\frac{1}{4}$ inch. Seeds two or three only, smooth and with very hard seed coat. Embryo straight with minute radicle and large round cotyledons, enclosed in thin fleshy endosperm. **t. 98.** Wight Ic. t. 972.

One of the commonest of shola trees. On the Nilgiris in both halves of the plateau up to 7,500 feet. Coonoor 6,000 feet. Sometimes under other trees but also above them. Pulneys abundant.

Gen. Dist. On the Western Ghauts, south-east Himalayas, Assam, Burma, Malay Peninsula down to Penang, Yunan and China.

In t. 98 : *f.* flower after removal of the sepals, petals and one stamen showing the crenulate five-partite disc inside the stamens ; *s.* seed, showing the thick testa and embryo inside ; *ś.* embryo showing large cotyledons and very small radicle.

SAPINDACEÆ.

Trees, shrubs or climbing herb, with alternate simple or pinnately compound leaves, and panicles of flowers with five sepals and petals, usually eight stamens, and an ovary of three carpels ; and characterized also by the presence of a crenulate or lobed disc (honey-secreting gland) outside the stamens (but in DODONEA inside). The fruits are in some genera (ACER) winged, but not in ours.

Well-known extra-Indian members of this family are the Litchee (NEPHELIUM) of China, in which the seed is covered with a thick edible " aril " ; the Maples and Sycamore (ACER) examples of which are grown in gardens ; and the Horse Chestnut. The Indian soap-nut tree is a species of SAPINDUS, the genus which gives its name to the family—SAPO INDICUS—Indian soap.

KEY TO THE GENERA.

Trees with 3-foliate leaves and small flowers in erect slender spikes . . . . ALLOPHYLUS.
Shrubs with erect shiny simple leaves, reddish flowers and 3 (or 4) winged capsule . . . . DODONÆA.

ALLOPHYLUS. F.B.I. 44 V.

Small trees or shrubs with simple or three foliate leaves and small globose, uni- or bi-sexual flowers, white or yellowish, in simple or branched axillary spikes. Sepals 4. Petals 4, small or obsolete, naked inside or with a reflexed shaggy scale. Disc of four glands. Stamens 8,

inside the disc. Ovary usually two-lobed, of two cells with one seed in each cell. Fruit indehiscent ; seeds erect with short aril, embryo curved, cotyledons folded.

Species about 20, chiefly in tropical America, also Africa, tropical and South Madagascar and Indian Archipelago.

Allophylus serratus *Radlk.* ; *F.B.I.* as part of A. Cobbe *Bl.*, described as a very variable species, i 673, V. 2. A tree. Leaflets 3, elliptic or obovate, cuspidate, about $2\frac{1}{2}$ by $1\frac{1}{4}$ inches at this elevation, with short hairs on the upper side and tomentose on lower ; petiole 2 inches. Spikes unbranched, longer than the petiole but shorter than the whole leaf, with cyme-like fascicles of small globular flowers, about $\frac{1}{12}$ inch across. Petals with a hairy scale on the inside. Fruit $\frac{1}{4}$ inch ovoid, embraced at the base by the small sepals. **t. 99.** Roxb. Fl. Cor. t. 61.

Nilgiris : About Coonoor and Kotagiri and lower down. Shevaroys : near Yercaud.

In *Gamble's Fl. Mad. Pres.* five species are given, four being included in A. Cobbe in the *F.B.I.*

DODONÆA. F.B.I. 44 XX.

Shrubs with alternate exstipulate leaves, greenish or brownish, unisexual or bisexual flowers with small sepals, no petals, large anthers, a dry fruit breaking septicidally into two to six valves, winged on the back, and seeds without aril containing a spirally coiled embryo.

Species 40 to 45 all, with two exceptions, Australian.

Named by Linnæus in honour of Robert Dodoons, a botanist and physician.

Dodonæa viscosa *Linn.* ; *F.B.I.* i 697, XX 1. A bush or small tree with thin ascending branches, the youngest angular or compressed, the older round, not

lenticelled. Leaves erect, simple, 2 to 4 inches by $\frac{1}{2}$ to $\frac{3}{4}$ inch elliptic or oblanceolate, acute at both ends and narrowed to the hardly distinct petiole, dotted above and below with small surface glands and shining with the secretion poured from them, quite glabrous : midrib prominent, lateral nerves straight, close ($\frac{1}{8}$ inch apart); margin entire revolute. Flowers in terminal cymose bunches, some unisexual. Sepals five, oblong, ciliate. No petals. Stamens eight with large ($\frac{1}{8}$ to $\frac{1}{16}$ inch) anthers and very short filaments, set in the normal flowers outside the small disc which surrounds the ovary, in the purely staminate flowers without disc. Ovary three to four-celled, with short angular style and lobed stigma. Fruit a reddish or pinkish-brown capsule with very thin walls and three or four broad wings, breaking through the partitions into its constituent, winged cells. Seeds black with only a very short thick stalk, but no aril; wood dark brown, hard and heavy and useful for tool-handles and walking sticks (F.M.P.). **t. 100.** Wight Ill. i. t. 52. (D. burmanniana.)

In open places and on the edges of sholas, abundant in the drier parts of the Nilgiri plateau, especially on abandoned land. Pulneys : below Kodaikanal. Shevaroys.

Gen. Dist. One of the commonest plants in India, extending from the Indus to Ceylon and distributed in all warm countries.

SABIACEÆ.

A small family closely allied to the Sapindaceæ and represented here by only one genus with two species.

MELIOSMA. F.B.I. 45 II.

Flowers small, crowded and almost sessile on the branches of racemose panicles. Sepals five, smaller than

9

the petals. Petals three, outer $\frac{1}{16}$ inch, triangular, enclosing all the rest of the flower, two inner reduced to very small bifid scales behind the two fertile stamens. Filaments of fertile stamens strap-shaped with a broad hollowed scale at the top and two globular anthers. Sterile stamens three, as scales fitting over the ovary, with two lateral hollows like double ears. Ovary $\frac{1}{30}$ inch, silky. Fruit a small drupe the size of a pea.

Species 45, mostly natives of tropical and sub-tropical Asia ; some in the Antilles and from Mexico to Brazil.

Leaves simple, 6 to 10 inches long, hard ; flowers in large panicles solitary at the ends of the branches . . M. Wightii.
Leaves pinnate ; panicles in the axils of the uppermost leaves and bracts forming flat compound masses. . M. Arnottiana.

Meliosma Wightii *Planch ; F.B.I.* ii 4, II 3 ; Spiræa tree. Usually a small tree, though in the middle of a shola it may attain a good height, of irregular outline, the foliage being in lumps of a few large drooping leaves ; recognized at once, when in flower, by the tall pyramidal panicles of small cream-coloured flowers (recalling those of the Mango).

Branchlets thick, studded with numerous large lenticels $\frac{1}{10}$ inch long, and coated with a yellowish tomentum of branched hairs. Leaves alternate, simple, 4 to 8 by 2 to 3 inches, elliptic or obovate, the youngest with a few short sharp teeth about one inch apart, towards the apex, otherwise entire ; dark green and glossy on the upper side with a few hairs only, yellow-tomentose on the prominently raised reticulate veins of the lower and more especially in their axils. Panicles terminal, tall and well branched, thickly covered with small flowers, in bud for some weeks before the rains, and then fawn coloured and drooping ; when out a creamy yellow.

Wood reddish-brown, soft and useless. Fruit $\frac{1}{3}$ inch. **t. 101**. Wight Sp. Nilg. 34 and 35 Ic. t. 964, 3. (*Milingtonia*).

Common in sholas at the highest levels, near Ootacamund and eastwards and westwards, and on the Kodaikanal downs. At lower levels its place is taken by the next species.

Gen. Dist. Western Ghauts, Coorg, Mysore, northwards to Bombay and southwards to Ceylon (5,000 to 7,000 feet).

Meliosma Arnottiana *Wight ; F.B.I.* ii 6, II 9. A round-topped tree, common in sholas and the open hill-side, flowering before the rains with broad shallow cream-coloured masses of small flowers.

Tree 30 or 40 feet in the shola, or in the open 15 to 20 feet ; round-topped ; trunk thick. Young parts generally and leaf-stalks and midribs clothed with brown rusty pubescence. Branches angular, with very large lenticels, as much as $\frac{1}{5}$ inch long and leaf-scars of $\frac{1}{2}$ inch. Leaves 6 to 10 inches usually drooping the main stalk with thick pulvinus-like base ; leaflets eleven, progressively larger from the basal pair upwards, 2 to 9 by 1 to 2 inches, ovate-lanceolate, acute or acuminate, rounded at the base, glossy on the upper side, dull on the lower ; stalk and midrib rusty or pinkish ; nerves seven to eleven pairs with tufts of hairs in the axils, much raised on the lower side ; secondary reticulation very fine. Flowers in compound panicles made up of panicles in the axils of the uppermost leaves and bracts, each 6 to 10 inches, branches of panicles spreading stiffly, crowded with flowers. **t. 102.** Wight Ill. t. 53. (*Milingtonia.*)

Nilgiris : very common on the lower parts of the plateau ; in sholas west of Pykara down to Naduvattam 6,700 feet and below ; Kotagiri and slopes to north and east. Also in Coonoor at the first bend on the road from the station. Not near Ootacamund or Kodaikanal.

Gen. Dist. Western Ghauts, Coorg, etc., to Bombay, Manipur, Burma and Ceylon.

The flowers have a sweet almost sickly honey smell, and come out early in May before the rains in such quantities as to make the whole tree cream-coloured and unmistakable even at a distance.

LEGUMINOSÆ.

This large order comprises three easily distinguished families. *A.* PAPILIONACEÆ consisting of the Pea, Gram, Bean, Clover, Vetch and their allies; *B.* CÆSALPINEÆ consisting of the Tamarind, CASSIA, POINCIANA, BAUHINIA, and other trees common on the plains; *C.* MIMOSEÆ consisting of ACACIA and its allies. These three families are alike in having one carpel only to the ovary attached below the rim of the more or less hollowed flower-stalk (*calyx tube*), and seeds containing a curved embryo with much proteid matter as well as starch in the thick cotyledons; many have an outgrowth round the micropyle (strophiole). Most have compound leaves, and both main and subsidiary stalks are attached by a swollen base (*pulvinus*) which bend up or down carrying the leaf and leaflets with them.

The PAPILIONACEÆ, found all over the world are well represented here; the CÆSALPINEÆ, mainly tropical, are doubtfully indigenous at these levels: the MIMOSEÆ, an almost entirely tropical family, occur only where planted.

PAPILIONACEÆ.

Bean, Pea, Gram, etc.

The flowers of this family are remarkably alike in general appearance, and different from all others. The Sweet-pea may be taken as an example. There is a

green more or less bell-shaped calyx with five teeth. Of the petals, the top one is much the largest and wraps round the others in bud: this is conveniently called always the *standard.* Below and inside this are a pair, called the *wings*; and between these again a second pair which are united towards the tip and are together called the *keel.* This *keel* encloses the ovary and stamens. The latter, ten always in number, are nearly always connected into a tube, either complete, all ten being united (*monadelphous*), or with a split on the upper side in which is one free stamen (*diadelphous*) as in the Sweet-pea. The ovary is attached by a short stalk somewhat below the level of the other parts to one side of the deeply hollowed centre, and has one row only of seeds inside, attached to the upper edge. It narrows gradually into the style, which is usually bent sharply upwards, and ends in a small stigma. The Sweet-pea has a pod which opens by both the upper and the lower edges, and this is the usual type of fruit; but in some the pod breaks up transversely into a number of one-seeded sections, which may open or not; and in a few genera there is only one seed and the pod does not open.

Exceptions to the above are that in the common introduced Gorse, ULEX, the calyx is coloured yellow and divided deeply into two parts; and that in SOPHORA the keel petals are hardly united, and the stamens are all free. Otherwise the flowers are all made on this plan. There are small individual differences, which serve to distinguish the genera. In CROTALARIA and the introduced Gorse and Broom, the anthers are small alternately short and attached lightly by the middle of the back (versatile), or long and fixed firmly at the base: in the Beans, PHASEOLUS, the keel and its enclosed stamens and style are remarkably long and curled up into a complete spiral. In some genera the keel is sharp-pointed, in others blunt; in DUMASIA it is joined more or less firmly at the back to the wing petals. In some the style is hairy all round; in others only on the upper side; in others again it has no hairs; and in one genus, DUMASIA, it has a thickening just at the bend. These differences only serve to show the essential similarity of the flowers. Greater and more useful differences

occur in the leaves. These may be simple, as in CROTALARIA, or composed of leaflets : either three only, all equally stalked (*digitate*) or with the central stalk longer (*pinnately trifoliate*) ; or several, either an even number, or an odd number, i.e., in pairs with one at the end ; or as in the Vetch with a tendril at the end. It is chiefly by these differences that the family is divided into sections (tribes).

In all the PAPILIONACEÆ the base of the leaf-stalk (or, if that is very short as with most leaflets, the whole of it), is swollen and so constructed as to be capable of bending up or down. By doing so, it changes the position of the blade morning and evening, so that while by day the blade is more or less horizontal, at night it becomes more or less vertical. The evening movement is in some cases upwards, in others down ; and often brings the blades not only vertical but also with the upper sides of adjacent leaflets together : and sometimes the leaflet is folded along the midrib with the same effect. It is apparently a protective movement designed to prevent loss of heat by radiation to the sky, and is shared, but to a much smaller extent, by a number of other plants. Attention is here called to it because it is one which one can hardly help noticing if out after dark.

The PAPILIONACEÆ show interesting adaptations to the visits of insects to their flowers. In some cases the simple weight of the insect pressing the keel petals down brings the anthers into contact with its body. In flowers with sharp pointed keel pollen is shed previously out of the anthers, and when a heavy insect, such as a bee, alights on the keel, is pushed out by the style. This is the purpose of the hairs below or round the stigma. More advanced still is the mechanism of the Gorse and Broom, for here the staminal tube is inclined to rise but is held down by the keel, and when an insect presses with more than a certain weight on this, is suddenly released and springing up sends out a cloud of pollen. These flowers require the visiting insect to be of some weight, and do not waste their pollen on butterflies, but give it to bees. On the other hand, there are flowers, mostly of a red colour, in which the release of the stamens is brought about quite easily by a slender proboscis separating the knobs on the wings or keel which hold the stamens down. Such flowers offer honey to their visitors and are adapted for butterflies. Individual flowers differ in

details, and these are well worth investigation. The lateral facing of the flower ; its blaze of yellow for bees, or red for butterflies, so that the right insect may easily find it ; and the little details of anthers, keel and wings, must all be regarded as designed for the one end of cross-pollination : and the precision with which a flower will open to the insect and close again after planting pollen on that part of its body which will come in contact with the stigma of an older flower, shows how well every part is adapted to its purpose.

KEY TO THE GENERA.

a { Very spiny green shrub without flat leaves. *p.* 136. ULEX.
  Leafy plants . . . . *b*

b { Anthers alternately long and pointed or short and rounded . . . . *c*
  Anthers all similar . . . . *d*

c { Leaves all simple ; pod inflated . *p.* 138. CROTALARIA.
  Stem green, angular ; leaves small or absent . CYTISUS.
  Climber : flower purple : pod very hairy *p.* 166. MUCUNA.

d { Pod 1-seeded—herb—leaflets 3 . *p.* 160. LEPTÓDESMIA.
  or shrub *p.* 158. LESPEDEZA.
  Pod 1-seeded—Trees . . . . *o*
  Pod 1-seeded hairy herbs : leaflets 7, narrow PSORALEA.
  Pod 2 or more seeded . . . . *e*

e { Pod jointed and breaking between the seeds . . . *f*
  Pod not jointed, opening by edges . . . . *g*

f { Flowers yellow . . . . *p.* 158. SMITHIA.
  Flowers pink or blue : joints of pod flat . DESMODIUM.
  Flowers blue : joints turgid . . . *p.* 160. ALYSICARPUS.

g { Leaves at least the lower of three leaflets . . . . *b*
  Leaves old pinnate, flowers blue, mauve, pink or white *p.*
  Leaves pinnate ending in a branched tendril. *p.* 164. VICIA.

h { Stalks of leaflets all equal . . . . *i*
  Stalk of middle leaflet distinctly longer than the others *k*

i { Leaflets notched or heart-shaped, finely toothed ; tender herbs with creeping stem or erect . . . . *g*
  Lfts. not toothed, gland-dotted as also petals. FLEMINGIA.

j { Flowers blue, solitary or in pairs . *p.* 154. PAROCHETUS.
  Flrs. in heads, yellow, white or pink. *p.* 153. TRIFOLIUM.

k	Leaflets gland-dotted	*l*
	Leaflets not gland-dotted	*m*
l	Flowers in stalked pairs : pod indented. *p.* 170.	ATYLOSIA.
	Flowers in racemes : pod flat, 1 to 2 seeded .	RHYNCOSIA.
m	Flower yellow : calyx truncate. . *p.* 165.	DÚMASIA.
	Flower purple, small : standard equal to wings.	SHUTERIA.
	Flower purple, showy : standard exceeding wings . .	*n*
n	Upper lip of caylx long ; large woody climber . . . *p.* 167.	CANAVALIA.
	Calyx teeth equal : keel and ovary inside spiral . . . *p.* 167.	PHASEOLAS.
	Calyx teeth equal : keel straight .	VIGNA and DOLICHOS.
o	Flowers yellow, showy . . . *p.* 176.	PTEROCARPUS.
	Flowers white, small . . . . *p.* 175.	DALBERGIA.
p	Flowers pink, leaflets elliptic . . *p.* 155.	INDIGOFERA.
	Flowers mauve, leaflets oblong . . . *p.* 177.	SOPHORA.
	Flowers white. Climber . . . . *p.* 176.	DERRIS.
	Flowers blue or white, shrub or herb p. 157.	TEPHROSIA.

ULEX. 50 VII.*

Furze or Gorse.

Spiny shrubs, the main branches thickly set with short branches ending in thorns and bearing other short thorns and spine-like leaves. Flowers yellow in masses. Calyx yellow like the petals, deeply divided into two lips, which are finely toothed and hairy ; with two small broad bracteoles at the base. Stamens alternately with short versatile anthers and long rigid ones. Pod short, few-seeded, seeds with strophiole.

Species about 24 scattered over western Europe and North Africa.

Name said to be connected with the Celtic Ac.= a point.

Ulex europæus *Linn.* ; VII * 1 ; common Gorse. Calyx hairy ; bracteoles $\frac{1}{10}$ to $\frac{1}{8}$ inch easily seen, hairy. **t. 103.**

An introduction well established near Ootacamund and at Kodaikanal presumably from Britain, where, as Gorse, Furze or Whin, it is common on dry gravelly ground. The species is spread all over western Europe, wherever the ground is stony, and as far east as northern and central Germany and southwards to Teneriffe, but not to the Mediterranean. *Ger.* Stechginster, *Fr.* Genet piquant.

If the keel be pressed down it will begin to split against the staminal tube, till pollen is suddenly ejected in a little cloud. (*Cf.* Cytisus.)

CYTISUS. 50 VII.*

Broom.

Shrubs with green angular stems, leaves small, three-foliate or simple. Flowers yellow or white, solitary or fascicled in the leaf-axils. Calyx with short broad lips. Stamens all joined into a tube; anthers alternately longer and attached near their base, or shorter and lightly attached by the middle. Pod opening by both edges; seeds many with fleshy outgrowth strophiole near the hilum, smooth and olive green in colour.

Species about 40 belonging mostly to the countries bordering the Mediterranean; from one of the islands CLYTHOS, it was said by Pliny to have taken its name.

Flowers white, ½ inch . . . . C. monspessulanus.
Flowers yellow, 1 inch . . . . C. scoparius.

Cytisus monspessulanus (Genista candicans *L.*); VII ** 1; White Broom. Stems thin, closely grooved. Flowers white, often several together in a leaf-axil, ½ inch or less. Style glabrous, short, curving upwards but not coiled as in *C. scoparius.* Pod hairy all over, small.

By roadsides in Ootacamund introduced from European gardens, native of Algeria.

Pollen is pushed out by the weight of the insect depressing the keel. There is no explosion as with *C. scoparius.*

Cytisus Scoparius *Link* ; VII* * 2 ; common Yellow Broom. Foliage very dark-green ; upper leaves reduced to single leaflets. Flowers usually solitary in the leaf-axils, yellow. Style hairy, very long and coiled. Pod 1¼ by ⅓ inch smooth, but with fine long hairs down the sutures. **t. 104.**

Established in Ootacamund and the cultivated valleys to the south, a native of western Europe, common in England and Scotland on dry hilly wastes. *Ger.* Ginster, *Fr.* Genet.

The mechanism for cross-pollination is interesting. Insects are attracted by the yellow colour of the flowers, but there is no honey, though the reddish streaks at the bottom of the standard would suggest that honey could be found below. The keel petals and wing petals are interlocked by folds near the base of each, and tend to move downwards, but are prevented by the stamens and style held under the rounded tip of the keel. When a fairly heavy bee alights on the flower it grasps the wings with its middle and hind legs, and pushes its forelegs and head down the opening at the base of the standard. In doing this it depresses the wings and keel petals, and the latter come apart and allow the five short stamens with their stiffer anthers to spring up and scatter pollen on the insect's lower surface. Then the longer stamens also spring out and, with a more violent explosion, scatter more pollen all over the bee. The long style, coiled inside the keel, also comes and winds itself round the insect's body, taking any pollen which the latter may have brought from another flower. Once opened in this way the flowers do not close again.

CROTALARIA. F.B.I. 50 VIII.

The peculiar characteristic of the genus is the inflated pod in which the seeds rattle about when ripe, and its name is from the Greek KROTALON, a child's rattle.

Great differences occur in the general habit, some species being trailing plants, others erect herbs, and others again quite large shrubs or small trees. There are differences too in the

stipules, for these may be ear-shaped encircling the axis, or prolonged downwards as narrow wings, or absent altogether. Some species are nearly glabrous, others covered with a shiny coating of silky hairs. And by a combination of these characteristics the genus, being a very large one, is conveniently divided into sections. But the flowers are remarkably uniform.

The calyx has always a short tube and five nearly equal teeth ; the corolla, in all our species yellow, has a broad rounded standard and sharp pointed keel ; the stamens are all united into a tube (monadelphous) and are of two lengths, alternately short and long, and with anthers round and versatile, or pointed-oblong and rigidly fixed to the filament ; the style has a tuft of hairs at the tip ; and the pod, as said above, is always much inflated. All our high level species have simple leaves but digitately (not pinnately) compound leaves also occur. The wing petals have each a patch of minute ridges or puckerings, which no doubt is of value in connexion with the visits of insects.

Species about 250, scattered over the tropics and the subtropical parts of the world, but not in temperate regions. The F.B.I. gives 77 species for India alone, to which must be added seven or eight described since.

KEY TO THE SECTIONS.

Leaf simple.

Stipules broad at the top and decumentas wings nearly to the next leaf, shrubs and wiry herbs . . . . . § 3. *Alatæ.*

Stipules narrow or ear-shaped, curved : shrubs. . . § 7. *Eriocarpeæ* .

* Spikes few : foliage glabrous : pods hairy.

* * Spikes panicles : foliage silky : pods smooth.

Stipules small or o : leaves very silky, racemes or panicles terminal :—

Erect plants; pod two or more times as long as calyx. § 6. *Erectæ.*

Low plants; pod shorter or not much longer than calyx. § 4. *Calycinæ.*

Stipules small or 0: leaves not silky, racemes mostly leaf-opposed—prostrate plants . . . . . § 2. *Diffusæ.*

Leaves of three leaflets.

Erect shrubs and undershrubs . . . § 9. *Trifoliatæ.*

KEY TO THE SPECIES.

a	Leaves simple	*b*
	Leaves of three leaflets	*i*
b	Stipules broad at the top and decurrent to nearly the next leaf, forming wings to the stem	*c*
	Stipules ear-shaped oblong or curved	*i*
	Stipules small or absent	*d*
c	Shrubs; ls. to 4 inches, fls. 1 inch.	1. C. Wightiana.
	Shrubby to 2 feet, leaves mostly 1 inch.	2. C. scabrella.
	Usually ½ foot, leaves ¼ inch, narrow pod ¾ inch with stalk of one-sixteenth of an inch . .	3. C. conferta.
	Small bushy plant: corolla two-thirds of calyx.	5. C. Bourneæ.
	Stems prostrate, not much branched: corolla about equal to the calyx	4. C. ovalifolia.
d	Racemes of flowers opposite leaves. . .	6. C. Fysonii.
	Racemes of flowers terminal	*e*
	Racemes of flowers in the upper leaf-axils	*h*
e	Tall shrubs or herbs	*f*
	Trailing plants or small herbs	*g*
f	Spikes slender, leaves glabrous above	9. C. Leschenaultii.
	Spikes slender, leaves shaggy on upper side.	11. C. barbata.
	Spike very short, leaves silky	10. C. formosa.
g	Branches erect. Racemes simple, terminal. Leaves ¾ inch wedge-shaped	7. C. albida.
	Calyx very brown shaggy; two upper teeth overtopping the corolla. Corolla 1 inch	8. C. calycina.

h { Racemes long, bracts very conspicuous, shining, deflexed. 17. C. subperfoliata and 16. C. shevaroyensis
Racemes short, but peduncled. 15. C. madurensis.

i { Large shrub or small tree. Stipules conspicuously ear-shaped, flowers in handsome terminal spikes, the pod pubescent . . . 12. C. semperflorens.
Shrubs similar to the above but pod very shaggy. 14. C. obtecta.
Low undershrub . . . . 13. C. Walkeri.

j { Leaflets 1 inch obovate . . . . 18. C. Notonii.
Leaflets 3 to 4 inches acute . . . . . . 19. C. striata.

§ 3. *Alatæ.*

In all the five species which follow the stipules are continued downwards as wings, broadest at the top. Three species were formerly considered to be varieties of C. rubiginosa *Willd.* This however was an error, Willdenow's plant belonging to the west India, not the East Indies (see note in F. I. N. and P. Ht., Vol. I, p. 102). The first three species may perhaps be regarded as climatic or altitudinal varieties of one, and the last two are also certainly closely allied to each other.

1. **Crotalaria Wightiana** *Graham*; *F.B. I.* ii 69. Shrubs up to 3 or 4 feet. Leaves up to 4 inches by $\cdot 3\frac{1}{2}$, covered with golden silky hairs. Upper end of stipular wing very broad with hooked apex. Flowers 1 inch. Pod to nearly 2 inches. A handsome shrub.

Nilgiris below 6,000 feet. Pulney Hills on old ghaut below Shembaganur, etc. Shevaroys.

2. **Crotalaria scabrella** *Wight and Arnott; Wight Cat.* 692 ! ; *F.B.I.* ii 69, as a var. of *C. rubiginosa*; VIII 18. A sturdy bushy plant 1 to 2 feet, with hard and stiff branches; most variable as regards size of leaves and stipules in different parts of the same plant: older parts often black, with large persistent stipular wings 1 inch across, wider than the leaves. Leaves elliptic, ovate or

obovate, acute, mucronate, silky on both sides, or slightly scabrid above, from 1½ by 1 inch on strong parts to 1¼ by ⅙ inch on short lateral branches and then like C. conferta : nerves three to four pairs impressed on the upper side, raised on the lower. Peduncles 2 to 4 inches, two to four-flowered, attached about 1 inch below the opposing leaves : bracts ¼ inch lanceolate, ciliate, with distinctly swollen base ; lower two or three empty : bracteoles on the calyx, ⅕ inch, falcate lanceolate, acute. Calyx tube very short ; lower teeth ⅔ inch, upper nearly as long, divided half-way. Corolla scarcely exserted. Pod 1¼ by ⅔ inch ; seeds sixteen to twenty. **t. 105.**

Nilgiris and Pulneys : on the open downs on banks in long grass, etc.

3. **Crotalaria conferta** *Fyson* ; distinguished from C. scabrella *Wight and Arnott*, by the uniformly smaller leaves, more distinctly stalked and shorter pod, and corolla exserted from the calyx. Branches from a rootstock, twiggy, 6 to 8 inches. Leaves ⅔ to ½ by 1/12 to ¼ inch elliptic acute at both ends, silky pubescent and glossy on both sides, drying a rich shiny brown ; nerves not conspicuous below ; stipular wing ⅓ inch at the top, narrowing in a curve gradually to the next node. Peduncles ¾ inch, with one or more small bracts and aborted flowers. Calyx ½ inch, very silky. Corolla larger. Pod ¾ by ⅓ inch with stalk of 1/15 inch.

Pulneys: on the downs above 7,000 feet in grass.

Though I originated this species and it is accepted by Gamble in *F.M.P.* I am inclined to think it should really be merged in the preceding.

4. **Crotalaria ovalifolia** *Wall. Cat.* 5411 *! ; typica* of *F.B.I.* ii 69 as C. rubiginosa but *not of Willdenow* ; VIII 18-*a*. Rootstock perennial, 3 inches, thick ; branches

weak, 6 to 12 inches, diffuse or more or less erect in herbage; all green parts pubescent. Leaves nearly sessile, $\frac{1}{4}$ to 1 inch, elliptic to obovate or orbicular, obtuse or emarginate; when young clothed as are all the younger parts and veins underneath with soft grey or brown pubescence, at length glabrescent; upper sides drying black, lower with three or four pairs of prominent raised veins: stipules decurrent to the leaf next below or half-way only. Peduncles 2 to 3 inches, with one or two flowers, the lowest bract fertile: bracteoles $\frac{1}{8}$ inch, lanceolate-acute on the very short calyx tube. Calyx teeth $\frac{1}{3}$ to $\frac{3}{4}$ inch, hairy not silky. Corolla included or hardly exserted. Pod $1\frac{1}{4}$ by $\frac{1}{3}$ inch, sessile or practically so. **t. 106**. Wight Ic. t. 885.

In grass on the open downs. Nilgiris: on Snowdon 8,000 feet. *Wight Herb. Prop.* Nos. 689, 690, 690-A; *Schmidt*; *Gœrtner*. Pulneys: *Wight Kew. Dist. No.* 586 *at Kew.*

Shevaroys: near Yercaud, flower December-January.

Gen. Dist. Dindigul *Wall. Cat. No.* 5411; Mayaburan *Sir F. Adam.*

5. **Crotalaria Bourneæ** *Fyson No.* 1093. Stems from the rootstock much forked, 4 to 6 inches, more or less erect, slender, pubescent. Leaves $\frac{3}{4}$ to $\frac{7}{8}$ by $\frac{1}{5}$ to $\frac{1}{4}$ inch, elliptic or oblong, obtuse or sub-acute at both ends, densely pubescent on both sides, drying black above: nerves three or four pairs raised underneath: stipules $\frac{1}{3}$ inch or less at the top, narrowing suddenly to a barely visible wing extending a little more than half-way to the next node. Peduncles $\frac{1}{2}$ to $\frac{3}{4}$ inch, leaf-opposed, one-flowered with a bract and aborted flower at about the middle. Calyx tube $\frac{1}{12}$ inch, with two linear-oblanceolate distinctly stalked bracteoles attached at the base; teeth $\frac{1}{2}$ inch. Petals included two-thirds of calyx. Pod 1 by $\frac{1}{8}$ inch, with stalk of $\frac{1}{10}$ inch. **t. 107.**

Pulneys in grass.

Allied to C. ovalifolia *Wall.*, and like it leaves drying black above but branches stiff though slender, and very much more bifurcating, leaves two or three times as long as broad, peduncles one-flowered, and corolla well included.

§ 2. *Diffusæ.* Prostrate plants with small or no stipules and flowers in racemes from opposite the leaves.

6. **Crotalaria Fysonii** *Dunn*; VIII 13 *. A small trailing plant with spikes of large yellow flowers from near the ends of the stems or branches.

Stems several from the perennial rootstock, 6 to 24 inches long, occasionally bifurcating, minutely ridged and usually downy, prostrate. Leaves all facing upwards, with pulvinus but hardly petioled, $\frac{3}{4}$ to $1\frac{1}{4}$ inches by $\frac{1}{2}$ to $\frac{7}{8}$ inch, mostly ovate; but the lower often smaller, $\frac{1}{4}$ inch, and rounded to orbicular; acute mucronate or retuse; usually more or less downy by white hairs springing from persistent swollen bases which roughen the surface when the hairs have fallen: margin revolute: nerves raised underneath, obscure above. Racemes terminal and leaf opposed; the stem entirely bare for 2 or 3 inches below them, ascending and carrying the four to six flowers up off the ground: bracts $\frac{1}{16}$ inch ovate acute or lanceolate, one-veined: pedicels $\frac{1}{4}$ inch: bracteoles minute or 0. Calyx obscurely two-lipped, shaggy with white hairs; teeth lanceolate acute, $\frac{1}{4}$ to $\frac{1}{3}$ inch or three or four times the short tube; upper teeth slightly broader than the lower and connate for one-third their length. Corolla well exserted, up to 1 inch or more across; standard pure yellow veined reddish brown especially on the back, often reflexed: wings with minute cross-ridges between the veins of the upper half. Style swollen and very hairy at the tip. Pod 1 to $1\frac{1}{4}$ by $\frac{1}{4}$ to $\frac{1}{3}$

inch, or three times the calyx, elliptic oblong or truncate, and broadest at the further end, usually downy, sometimes shaggy : seeds eight to ten. Varies much in hairiness, pods may be quite shaggy ; and there is also a perfectly glabrous form. **t. 108.**

One of the commonest plants on the Kodaikanal downs where it sprawls by roadsides, over the edges of paths and cattle-tracks or runs in the grass.

Does not grow on the Nilgiris and till collected by Sir Alfred Bourne was unknown to the herbariums of Calcutta and Kew. Described recently by Dunn, in Kew Bulletin 1913.

§ *Calycinæ.* Usually low-growing plants, with small or no stipules and terminal racemes of flowers, in which the calyx is hairy and the pods short.

7. **Crotalaria albida** *Heyne ; Wallich Cat. No.* 5401, 2 *and* 3 *! ; F.B.I.* ii 71, VIII 23. Branches numerous and slender from a short woody stem, forking low down but not branching above. Leaves subsessile, wedge-shaped, $\frac{1}{2}$ to $\frac{3}{4}$ by $\frac{1}{6}$ to $\frac{1}{5}$ inch, strongly one-nerved, with rounded end, covered on the underside with short hairs and small round translucent glands. No stipules. Flowers in long terminal racemes of eight to ten. Pedicels $\frac{1}{8}$ inch, calyx $\frac{1}{5}$ inch, hairy, two-lipped : the two upper lobes connate, and the three lower also connate, for about one-third. Corolla yellow : standard with green veins and a patch of silky hairs outside at the top, and with two scales at the base inside : wings a deeper yellow with a patch of cross-ridges. Style hairy. Pod quite glabrous. Seeds black and shiny with conspicuous radicle. **t. 109.**

Pulneys : Kodaikanal and below, flowering early spring. Nilgiris.

Gen. Dist. Hills of Ganjam and Vizagapatam. Tropical regions of India, Ceylon, Malay, China and the Phillipines.

8. **Crotalaria calycina** *Schrank ; F.B.I.* ii 72, VIII 28 ; Rabbit's Ears. Distinguished from all other (high level) species growing near the ground, by the densely hairy calyx, whose upper lip stands up like two brown silky ears behind the pale yellow flower.

An annual from a few inches to 2 feet, the stem and branches flexuous, and clothed throughout with erect, appressed, coarse brown hairs, more numerous and shining on the younger parts, which give the whole plant a brown shaggy look. Leaves $\frac{1}{2}$ to 1 inch, by $\frac{1}{6}$ to 1 inch, elliptic or oblanceolate, acute, sessile ; densely hairy on the lower side. Flowers at the ends of leafy branches. Calyx $\frac{3}{4}$ inch, very shaggy and brown, the two upper sepals $\frac{3}{8}$ inch wide, obtuse, united half-way, the two lower less than half as wide, free to the base and acute. Corolla glabrous, pale yellow, not exserted beyond the sepals ; standard with long hairs down the middle line behind or near the blunt apex. Pod sessile $\frac{1}{2}$ inch, enclosed in the calyx, glabrous, dark brown, very turgid, and closely packed with twenty-five to thirty seeds. **t. 110.**

Pulneys : common on the open grass land of the Kodaikanal downs.

Gen. Dist. Widely over the tropics of the Old World, from Africa to South India, Ceylon and North Australia and on the Himalayas eastward into Burma.

The plant appears to vary enormously according to locality. On the higher downs it is a dwarf (like C. crinita *Graham*) of 4 to 6 inches, with flat leaves $\frac{1}{4}$ to $\frac{3}{4}$ inch ; or in long grass a tall plant with linear leaves, of over 1 inch, densely clothed with long hairs which meet along the midrib. Near Vilpatti (a few hundred feet below Kodaikanal) and lower down it becomes a sturdy plant with elliptic acute leaves $1\frac{3}{4}$ by $\frac{1}{2}$ inch (*C. Roxburghiana* DC.) and at still lower levels it has a stem of 3 feet and more, and leaves 3 to 4 inches by $\frac{1}{2}$ inch ; but also a form with much narrower leaves like those of the tall grass form of the higher levels (*Bourne* 1067).

§ 6. *Erectœ.* Erect herbs and shrubs, with more or less silky foliage flowers in terminal racemes, and glabrous pods.

9. **Crotalaria Leschenaultii** *DC.*; *Wall. Cat.* 5407; *F.B.I.* ii 76, VIII 42. A small bush with erect rather long and narrow wedge-shaped leaves, handsome spikes of large yellow flowers, and enormous pods frilled at the base by the dried calyx.

Branches ascending from a perennial rootstock; stout to $\frac{1}{4}$ inch thick striated not hairy. Stipules $\frac{1}{8}$ inch, triangular recurved. Leaves sessile, 3 by 1 to 5 by $1\frac{1}{4}$ inches, oblanceolate-cuneate, green and glabrous above, clothed underneath with very regular short straight hairs; midrib prominent; lateral nerves straight nearly to the margin. Racemes of sixteen to twenty flowers; bracts lanceolate acute; pedicels $\frac{1}{3}$ inch, without bracteoles. Calyx tube $\frac{1}{4}$ inch broad; three lower teeth $\frac{1}{4}$ inch by $\frac{1}{8}$ inch at the base; two upper $\frac{3}{8}$ by $\frac{1}{4}$ inch. Corolla handsome; standard 1 by $\frac{7}{8}$ inch, notched spreading backwards, yellow but eventually *tinged at the base with* brown, wing-petals forming a steep roof over the keel, fading a reddish terra-cotta; keel $\frac{1}{4}$ inch by $\frac{1}{4}$ inch, with $\frac{1}{8}$ inch point, fringed with white hairs, fading yellow; style eventually protruding. Pod when young horizontal, sharply bent at the apex; when ripe 2 by $\frac{1}{2}$ inch, nearly rectangular in section, stalked and well exserted from the calyx which forms a conspicuous untidy cup at the base, and tipped by the stout persistent style. **t. 111.**

Flowers on the Pulney downs in September, the pods remaining till the following summer, on the open downs frequent on paths and clearings from 8,000 feet down as far at least as 5,500 feet. Nilgiris: (W. & A.). Shevaroys.

Gen. Dist. Not on the ghauts to the north nor elsewhere in India or beyond. It might be said to be replaced on the plains by *C. retusa.*

10. **Crotalaria formosa** *Graham, Wall. Cat.* 5393 ! ; *F.B.I.* ii 76, VIII 43. A shrub, distinguished by the tawny hairs of the stem and the very dense short thick racemes of yellow flowers. Foliage bluey-green.

Stem dwarfed, much branched, covered with tawny hairs ; stipules $\frac{1}{5}$ inch, narrow and curved downwards. Leaves 2 by 1 inch, obovate, narrowed to the short stalk, dark green above, silky below and brown with tawny hairs on the veins, mucronate ; usually stiffly erect. Racemes 1 to 2 inches long and as broad, pedicels short, densely silky. Calyx teeth $\frac{1}{4}$ to $\frac{3}{8}$ inch, four times the tube, shaggy, acute. Corolla rather small not much longer than the calyx, the standard veined brown. Pod distinctly stalked, at first black, afterwards green and finally straw-coloured, about $1\frac{1}{2}$ by $\frac{5}{8}$ inch, smooth and shiny, and frilled below by the dried calyx. **t. 112.** Wight Ic. t. 981.

Nilgiris : near Ootacamund on Snowdon, flowering September to February. In sholas and on the open downs near Pykara. Not known on the Pulneys.

The foliage is quite like *C. Leschenaultii* DC. in which however the spikes are four or five times as long, and there are no tawny hairs.

11. **Crotalaria barbata** *Graham, Wall. Cat.* 5394 ! ; *F.B.I.* ii 76, VIII 44. A sturdy shrub with erect spikes of rich yellow flowers, conspicuous against the dark brown axis and pedicels ; and with erect rather crowded leaves.

Branches thickly clothed with brown hairs. Leaves sessile (but pulvinus $\frac{1}{12}$ inch), erect, 2 to 4 inches, obovate with rounded base, clothed below with long white hairs, on the upper side nearly glabrous and glossy. Racemes

terminal, 4 to 8 inches; bracts $\frac{1}{4}$ inch, pedicels $\frac{5}{8}$ inch, densely clothed with dark brown hairs. Calyx very distinctly two-lipped; tube $\frac{1}{4}$ inch; teeth $\frac{3}{4}$ inch, the two upper broader than the three lower, all clothed with brown silky hairs. Standard 1 inch across, notched. Pod erect green, quite glabrous, $1\frac{3}{4}$ by $\frac{3}{4}$ inch, widest at the upper end, surmounted by the $\frac{1}{4}$ inch stout style with at the base the dried calyx. **t. 113.** Wight Ic. t. 980.

Nilgiris: Near Ootacamund on the slopes of Snowdon 7,700 feet, flowering Christmas. Pykara 6,600 feet. Coonoor. Not collected on Pulneys.

Gen. Dist. Only on the South Indian mountains of Nilgiris and Travancore, not northwards on the Bombay Ghauts.

§ *Eriocarpeæ.* Erect shrubs with small or large (not decurrent) stipules, terminal spikes or panicles of flowers, and hairy or smooth pods.

* Spikes few: foliage smooth: pod hairy.

12. **Crotalaria semperflorens** *Vent.*; *F.B.I.* ii 78, VIII 50. Distinguished by its large ear-shaped stipules, broad oval green leaves, and magnificent spikes of yellow flowers. One of the commonest of roadside shrubs.

Shrubs or small trees, up to 10 feet; branches striate: stipules up to $\frac{1}{2}$ inch, ear-shaped. Leaf-stalk $\frac{1}{3}$ inch, blade broadly ovate, 2 to 4 inches, conspicuously veined and densely pubescent on the underside, ultimately glabrous on the upper. Racemes terminal or opposite the leaves, naked for the lowest one-quarter; bracts small, reflexed; pedicels $\frac{1}{4}$ inch. Calyx teeth $\frac{1}{3}$ inch, twice the broad tube, narrow. Corolla well exserted; standard erect veined green. Pod oblong, turgid, $2\frac{1}{2}$ by $\frac{5}{8}$ inch, stalked above the persistent calyx. Seeds $\frac{1}{6}$ inch, brown, with very prominent radicle. **t. 114.** Wight Ic. t. 982.

By roadsides and the edges of sholas. Nilgiris : in Ootacamund itself very common. Pulneys on the downs above Kodaikanal and down to Shembaganur.

Gen. Dist. Tropical mountains of South India, Ceylon and Java.

A near ally of the common C. verrucosa *L.* of the plains, which however is but a herb and has blue flowers.

13. **Crotalaria Walkeri** *Arn.* ; *F.B.I.* ii 78 as *var.* of C. semperflorens. A low undershrub. Stipules small. Leaves smaller than in the last species and the smaller nerves few and not prominent on the lower side.

Nilgiri and Pulney hills, at lower levels.

14. **Crotalaria obtecta** *Grah.* ; *F.B.I.* ii 79, VIII 55. A straggling shrub densely clothed with brown silky hairs. Leaves 2 to 4 inches, nearly elliptic, obovate or oblong, velvety above and below. Stipules narrow, $\frac{1}{8}$ inch. Racemes close, 12 to 20 flowered. Pod $1\frac{1}{2}$ to 2 inches by $\frac{1}{2}$ to $\frac{3}{4}$ inch, densely covered with short stiff brown hairs.

Nilgiris : 4,000 to 6,000 feet. Coonoor, etc.

** Spikes many panicled : foliage silky : pod glabrous.

15. **Crotalaria madurensis** *Wight in Wall. Cat.* 5376 *!* ; *F.B.I.* ii 79, VIII 56. A small tree, 10 or 12 feet, with light brown stem and very regular upward sloping branches ending in large panicles of pure yellow flowers and covered with white hairs, some simple others stellate. Petioles $\frac{1}{3}$ inch all pulvinus, without stipules. Leaves obovate cuneate, with a silky sheen on the upper and on the nerves of the lower side. Nerves about twelve pairs, curving slightly forwards at the ends and joined by others, all raised on the lower side and depressed on the upper. Flowers racemed on axillary branches of

4 to 10 inches, which are leafy for the greater part and so form large leafy panicles 1 to 2 feet high by 6 to 8 inches wide: bracts boat-shaped $\frac{1}{3}$ inch, caducous after the standard has fallen; bracteoles similar. Calyx obscurely two-lipped; three lower teeth lanceolate, $\frac{1}{2}$ by $\frac{1}{6}$ inch at the base, two upper broader, ovate; all pubescent or silky with short white hairs. Corolla when open large and conspicuous; standard $1\frac{1}{8}$ by 1 inch, thinly silky on the back: wings obliquely obovate-oblong, $\frac{3}{4}$ by $\frac{3}{8}$ inch; all three petals alike in colour a light yellow without any red in it: keel $\frac{1}{2}$ inch at the broadest part, its tip $\frac{1}{8}$ inch light green. Pod $1\frac{1}{4}$ by $1\frac{1}{2}$ inches deep by $\frac{3}{4}$ inch broad, somewhat flattened above and below; when young thinly canescent, when ripe frilled by the brown but not much shrunken sepals. **t. 115.**

Pulneys: on the open downs, flowering July to September, and then a magnificent sight, especially on the hill-side to the left of the Poombari road two miles beyond the Observatory, and below the new ghaut road a little above Shembaganur. Nilgiris: top of Sigur ghaut; Coonoor. Appears to thrive on steep slopes.

16. **Crotalaria shevaroyensis** *Gamble; Kew Bulletin* 1917, 28. Somewhat like the last species but distinguished by its very conspicuous shining bracts and bracteoles which persist after the flowers have fallen.

A shrub—3 to 5 feet high. Leaves obovate or elliptic, acute at both ends: thinly silky and shiny both sides: veins about 9 pairs almost straight to the margin. Spikes terminal on short branches from the upper axils with two or three leaves only, and many bracts, forming large terminal panicles over 18 inches by 12 inches. Bracts

ovate brown shiny, deflexed ; upper sepals brown (thinly silky) on back, lateral narrow, acute. Corolla yellow, standard racemed erect, wings and keel pointing down. Pod $1\frac{1}{4}$ inches by $\frac{3}{4}$ inch. Stalked well beyond the sepals.

Shevaroys : roadside above Yercaud.

Gen. Dist. Pulneys and Dindigul hills at low levels (2,000 feet).

17. **Crotalaria subperfoliata** *Wt. F.B.I*, ii 79, VII 57. Very similar to the last species, but with fewer veins, more acute bracts and broad sepals enclosing the stalkless-pods, is abundant on Horsleykonda, flowering mid-February.

18. **Crotalaria Notonii** *W. & A. ; F.B.I.* ii 82, VIII 66. A shrub 2 to 6 feet high. All parts thinly pubescent with yellowish hairs ; stipules setaceous $\frac{1}{5}$ inch. Leaves trifoliate, rachis $\frac{3}{4}$ inch ; leaflets about as long, $\frac{1}{2}$ inch, broad, obovate or elliptic, obtuse mucronate. Flowers in axillary racemes, forming a large corymbose panicle 2 feet across. Bracts and bracteoles linear. Calyx teeth subequal, reflexed. Corolla yellow ; standard $\frac{3}{8}$ inch wide and long, streaked with brown and with two oval brown marks at the base, bent quite back ; wings $\frac{1}{8}$ inch wide, horizontal over the very acute keel. Pod $\frac{1}{3}$ inch, hardly longer than broad, with prominent incurved beak, finely pubescent ; seeds 1 or 2, dark olive brown. **t. 116.** Wt. Ic. t. 752.

Nilgiris : Coonoor, on the slope above Brooklands estate, etc., at 6,000 feet, common ; flowering best in September.

Gen. Dist. Western Ghauts, Nilgiri and Anamalai hills, 4,000 to 6,000 feet.

The flowers have the scent of the English Melilotus.

19. **Crotalaria striata** *DC.*; *F.B.I.* ii 84, VIII 73. An erect low shrub, 2 to 4 feet, with robust thinly silky branches. Petioles 2 to 4 inches. Leaflets, 3, 3 to 4 inches, obovate, oblong, obtuse. Flowers 20 to 50 in racemes of ½ to 1 foot, yellow striped with red. Pod cylindrical, ½ to 2 inches, slightly decurved, with 20 to 30 seeds.

Introduced on estates as a green manure and now run wild near Coonoor (*C. Brown*).

Gen. Dist. Himalayas to Ceylon and Malacca.

TRIFOLIUM.

Small herbs easily recognized by their conical heads (short spikes) of pink white or yellow flowers and the three leaflets on longish petioles. The leaflets show five teeth on the obtuse end, the keel-petals are obtuse, and all the petals persist and enclose the ripe pod.

A genus of temperate regions and cultivated for animal food. Here only as an escape. Species about 200.

Trifolium (three-leaf) was the Latin name of the common CLOVER.

KEY TO THE SPECIES.

Flowers red or pink, in dense globose heads 1 inch diameter, with a pair of simple leaves below; leaflets oblong obscurely toothed. An erect perennial herb, pod one-seeded (Red Clover) . . . . **T. pratense.**

Flowers white, or pinkish, in globose heads ¾ inch diameter, no leaves below; leaflets obovate, notched. (White Clover) **T. repens.**

Flower-heads yellow, ⅓ inch diameter, no leaves below; peduncles ½ inch, leaflets obcordate ¼ inch finely toothed. **T. dubium.**

These three species are all introductions from Europe and may be found in grass, flowering after the first rains.

PAROCHETUS. F.B.I. 50 XI.

A genus of one species only.

Parochetus communis *Hamilton ; F.B.I.* ii 86, XI 1. A small creeping plant with clover-like leaves, and blue and white flowers solitary or in pairs on slender stalks.

Stem or rhizome very slender, running to 2 or 3 feet, and rooting at the nodes. Leaf-stalks 1 to 4 inches leaflets three, ½ inch long, all sessile, obcordate or obovate cuneate, notched, glabrous on the upper, sparingly pubescent with coarse hairs on the underside and round the margin : stipules acute. Peduncles longer than the leaf-stalks, usually one, but occasionally two-flowered, with a pair of small bracteoles ½ inch below the flower. Calyx campanulate of four lobes (by union of the two upper teeth as shown by a small notch in the upper lobe) lowest tooth much the largest. Standard petal reflexed, blue, obovate with a short claw : keel abruptly bent upwards, narrow, white. Style glabrous : stigma capitate, eventually exserted beyond the keel. Pedicels after flowering reflexed. Pod ¾ by ⅛ inch, straight, opening by both margins. Seeds seven or more, ovate with hilum notch in the middle of one side. **t. 117.** Wight Ic. 483.

Very common on damp ground, in the open and round the edges of sholas ; in and near Ootacamund and on the Kodaikanal downs. Not at much lower levels nor on the ghauts to the north, nor apparently anywhere else.

Distributed widely over the higher mountains of tropical Asia, the Himalayas from Simla to Assam, the mountains of Burma, Java, etc. ; and of Africa and Zambesi land. The only species of its genus.

Named from the Greek PARA = *near and* OCHETOS = *a brook or conduit, because found in damp places.* (*C.F.S.*)

INDIGOFERA. F.B.I. 50 XVII.

Indigo, etc.

A large tropical genus distinguished by a more or less dense covering of white hairs closely appressed to the surface and attached by the middle (not at one end); by minute points at the top of the anthers; and by a continuous not jointed pod containing usually several seeds. Leaves in the majority of species pinnate (in one of ours three-foliate). Corolla generally pink and quickly falling; keel petals with a spur on the outer side near the base. Stamens diadelphous.

Nearly 300 species, scattered over all the warmer parts of the world, but more especially South Africa.

India alone has over 40 species, most of them growing on the plains. Indigo, by far the most important of blue dyes, was, until the last decade or two, obtained exclusively in India from the cultivated *I. tinctoria* and *I. erecta*, by fermentation of the stalks and leaves. Hence Latin name *indicum* for the colour and hence also *indigofera* (*fero* = I bear).

KEY TO THE SPECIES.

a { Leaflets three. Small trailing plant with young parts almost black, and bright red flowers . I. pedicellata.
Leaflets many . . . . b

b { Shrub with pinnate leaves and racemes of pink flowers . I. pulchella.
Trailing plant with purple flowers . . . I. endecaphylla.

Indigofera pedicellata *Wight and Arnott; Wight Cat.* 868 *!*; *F.B.I.* ii 95, XVII 15. Rootstock perennial; branches very slender, wiry, black-pubescent on the younger parts, trailing on the ground but not rooting. Petioles $\frac{1}{6}$ to $\frac{1}{4}$ inch; leaflets three, in the larger form occasionally four, $\frac{1}{6}$ to $\frac{1}{2}$ inch long, elliptic obtuse, covered with black glands. Flowers crowded six to twelve, in short corymbs; pedicels $\frac{1}{6}$ inch; bracts linear $\frac{1}{16}$ inch.

Calyx $\frac{1}{12}$ inch with long teeth. Corolla red. Pod $\frac{3}{4}$ inch straight, even, sharply pointed. **t. 118.** Wight Sp. Nilg. t. 56.

Very common especially on gravel paths and exposed spots in pastures. Pulneys near Kodaikanal, Nilgiris, Shevaroys.

In general habit this species is not unlike the very common *I. enneaphylla* L. of the plains, but differs in its three-foliate leaves and less crowded flowers. The floral mechanism to secure pollination by insects is also very similar. See Pres. Coll. Bot. Bull. No. 11.

There appear to be two forms distinct enough perhaps to be called varieties. In the smaller the leaflets are not more than $\frac{1}{3}$ by $\frac{1}{8}$ inch and very black below like the young branches, and the flowers $\frac{1}{4}$ inch bright red. In the larger the leaflets are not less than $\frac{1}{2}$ by $\frac{1}{4}$ inch when fully expanded; there is much less black on them and on the branches, and the flowers are considerably larger, about $\frac{1}{2}$ inch and pink rather than red. It is as if the same quantity of black and of red colour were distributed over larger areas. This larger form is the type of Wight and Arnott's species, Wight Cat. 868.

Indigofera endecaphylla *Jacq.; F.B.I.* ii 98, XVII 24. An annual herb with trailing stems 1 to 2 feet long. Leaves 1 to 3 inches, of 9 to 12 leaflets. Racemes up to 4 inches long, many-flowered. Flowers small, purple. Pod $\frac{3}{4}$ to 1 inch.

Nilgiris: on the borders of the plateau and below.

Gen. Dist. Hills of Deccan and Mysore, Western Ghauts, Coimbatore.

Indigofera pulchella *Roxburgh; F.B.I.* ii 101, XVII 37. Shrub, 4 to 6 feet with trunk up to 4 inches thick at the base and slender branches. Leaves 2 to 4 inches, of eleven to fifteen leaflets. Leaflets distinctly stalked, $\frac{3}{4}$ to 1 by $\frac{1}{3}$ to $\frac{1}{2}$ inch, elliptic or oblong-obovate, mucronate, dark green on the upper side, covered on both sides with very regularly arranged closely appressed hairs. Racemes 1 to 5 inches; pedicels very short. Flowers purplish pink, mostly before the leaves. Corolla $\frac{1}{2}$ inch;

standard petal reflexed persistent after the keel and wings have dropped. Pod straight 1 to $1\frac{1}{8}$ by $\frac{1}{6}$ inch, sharply pointed, glabrous, projecting nearly horizontally. Seeds $\frac{1}{16}$ inch. **t. 119.** Wight Ic. t. 367.

On the open downs. Pulneys : common above Kodaikanal. Nilgiris on the plateau in early spring, but does better at lower levels. Shevaroys : flowering Christmas.

Gen. Dist. Himalayas and other Indian hills above 5,000 feet, Kanara and the Ghauts to the north of us, Mahabaleshwar, etc.

PSORALEA. F.B.I. 50 XVIII.

Shrubs or herbs with odd-pinnate gland-dotted leaves and indehiscent one-seeded pods.

Species about 100 mainly in South Africa and North America.

Psoralea pinnata ; XVIII 3 ; a shrub of 2 to 6 feet, with numerous branches sloping steeply upwards and close set leaves of about seven narrow, linear, pointed leaflets. Flowers towards the ends of the branches, blue. **t. 120.**

Near Ootacamund on the bank of the deep cutting through which the road to Coonoor passes near the old aqueduct, and by the toll-gate. An introduction. Not recorded from anywhere else in South India.

TEPHROSIA. F.B.I. 50 XXII.

Herbs or undershrubs with odd-pinnate leaves, recognizable as a rule by the very close straight nerves which run at an acute angle to the margins of the leaflet. Flowers pinkish or white in terminal or leaf-opposed racemes. Pods straight, many-seeded.

Species over 100 in the tropics of both worlds.

Tephrosia tinctoria *Pers.*; *F.B.I.* ii 111, XXII 4. An undershrub covered with golden-brown pubescence. Leaflets variable in number from 3 to 13, the end one usually the longest, glabrous above, pubescent below. Racemes peduncled. Flowers red. Pod slightly bent, 1 to 2 inches. Wt. Ic. t. 388.

Pulneys : on the slope above Shembaganur, etc. Nilgiris ; Shevaroys, flower January.

Gen. Dist. Western Ghauts up to 7,000 feet, Mysore, Coimbatore and North Arcot.

Tephrosia candida *DC.*; *F.B.I.* ii 111, XXII 2. A shrub with slender, grooved, velvety branches : leaflets from 15 to 25, silky below ; white flowers, densely silky on the standard ; and a slightly curved pod 2 to 4 inches long, is grown as a green manure on Tea estates. It is a native of the Himalaya from Kumaon to Khasia.

LESPEDEZA. F.B.I. 50 XXX.

Herbs or undershrubs with pinnately three-foliate leaves and one-seeded indehiscent strongly-veined pods.

Species few.

Lespedeza sericea *Miq.*; *F.B.I.* ii 142, XXXII 1. An erect undershrub with long twiggy branches. Leaflets, linear cuneate, silky. Flowers white tinged with purple, about $\frac{1}{4}$ inch, in small fascicles in the axils of the upper leaves of short branchlets all down the branches. Pod $\frac{1}{8}$ inch, round, flattened, thinly silky.

Nilgiris : Ootacamund and down to Coonoor, Pulneys : 6,000 to 7,000 feet. (F.M.P. gives only Pulneys).

SMITHIA. F.B.I. 50 XXXVIII.

Herbs with short, pinnate leaves which end in a bristle and have sensitive leaflets, soon closing if plucked.

Flowers in axillary racemes, calyx two-lipped. Corolla blue or yellow; keel obtuse. Stamens in two bundles of five each. Pod jointed, or divided into one-seeded parts, and folded inside the calyx.

Species about 30 in the tropics of the old world.

KEY TO THE SPECIES.

Flowers in loose racemes with filiform peduncles and pedicels. Calyx with dense fringe of short hairs. . . S. gracilis.

Flowers in close or open corymbose racemes; calyx with yellow bristles on black bulbous bases . . . . . S. hirsuta.

Flowers in terminal panicles of corymbose racemes, one-sided in fruit; calyx with soft yellow bristles . . . S. blanda.

Smithia gracilis *Benth.; F.B.I.* ii 150, XXXVIII 6. A diffuse slender perennial plant. Leaflets 4 or 6. Flowers yellow. Calyx strongly ciliated. Pod veined.

Nilgiris and Pulneys, in grass, 5,000 to 7,000 feet.

Smithia hirsuta *Dalz.; F.B.I.* ii 151 in part. A small herb with short erect stem and trailing branches. Leaflets three pairs, $\frac{1}{5}$ to $\frac{1}{3}$ inch, wedge-shaped. Branches, petioles and calyx covered with yellow hairs on black bulbous bases; calyx conspicuously so. Flowers $\frac{1}{3}$ inch. yellow, standard erect.

Nilgiris: on the downs in damp places. Shevaroys: slope of Shevaroyan.

Gen. Dist. Western Ghauts, 3,000 to 7,000 feet. Eastern Ghauts.

Smithia blanda *Wall.; F.B.I.* ii 151, XXXVII 12. A tall almost shrubby plant, reaching 2 feet in height. Young branches hairy, old quite glabrous. Leaflets 6 to 10. Calyx lips equal, densely clothed with fine bristles. Corolla bright yellow. Joints of fruit $\frac{1}{12}$ inch. t. **121**. Wt. Ic. t. 986.

Nilgiris: 4,000 to 6,000 feet, Naduvattam. Shevaroys: slope of Shevaroyan.

Gen. Dist. Western Ghauts, Mysore to Travancore, East Himalayas.

LEPTODESMIA. F.B.I. 50 XLI.

Diffuse perennial herbs with one or three foliate leaves and small flowers crowded in dense terminal racemose heads, yellow or whitish by the dense hairs on the sepals. Stamens 9 and 1. Ovary with one ovule only; pod flat, one-seeded, and opening in two membranous valves.

Species two or three only.

Leptodesmia congesta *Benth.*; *F.B.I.* ii 152, XLI 1. Leaves roundish, ¾ inch. Heads of flowers ¼ to ½ inch.

Nilgiris 4,000 to 7,000 feet. Pulneys: Poombarai, Shembaganur.

ALYSICARPUS. F.B.I. 50 XLVII.

Herbs with slender stems, with one-foliate leaves, conspicuous stipules, small flowers in terminal racemes, and cylindrical pod constricted between the seeds like a row of beads, which separate into one-seeded, indehiscent parts.

Species about 20, weeds in the tropics.

Alysicarpus racemosus *Benth.*; *F.B.I.* as *var.* of A. belgaumensis, II 60, XLVII 9. A small erect plant with golden pubescence. Upper leaves sometimes three-foliate, lower one-foliate. Leaflet under 1 inch. Flowers purple, pedicelled in long racemes. Pod of three or four joints, not much exserted from the calyx. **t. 122.**

Nilgiris, 3,000 to 7,000 feet.

Gen. Dist. Northern Circars, Deccan, Western Ghauts, Nilgiris, Anamalais, etc. [*G.F.M.P.*]

DESMODIUM. F.B.I. 50 L.

A large tropical genus, characterized by the pods being composed of a number of flat one-seeded segments; the leaflets three, each with a pair of stipels; and the flowers in terminal racemes, blue or pink or a mixture of these colours, never yellow. The middle leaflet is usually the largest and has a longer stalk.

Species about 120, cosmopolitan in the tropics.

Named from the Greek DESMOS, *a chain, because of the jointed pod.*

KEY TO THE SPECIES.

Shrub; leaves 2 inches, racemes 2 to 4 inches, erect; flowers blue . . . . D. rufescens.

Twiggy plant; leaflets 1 to 3 inches across; flowers few, red. D. scalpe.

Very thin-stemmed twiggy plant; leaves not above $\frac{1}{2}$ inch, flowers blue or pinkish in very slender racemes . . . D. parvifolium.

Desmodium rufescens *DC.; F.B.I.* ii 171, L 37. A shrub, the slender branches, stipules, leaf-stalks and veins of the underside, densely clothed with reddish brown hairs. Leaf-stalks 1 inch; stipels linear, $\frac{1}{8}$ inch; leaflets obovate, cuneate at the base or rounded at both ends, mucronate, the upper side covered when young with a very fine pile of short grey hairs but glabrous when older, the underside covered with white silk. Racemes 3 to 6 inches, occasionally axillary, more densely flowered in the upper part. Pedicel $\frac{1}{3}$ inch, and calyx densely hairy. Corolla $\frac{1}{2}$ inch purple to deep blue. Staminal tube $\frac{3}{8}$ inch, slender, appearing often outside the keel; anthers obtuse, style abruptly bent, without hairs. Pod 1 by $\frac{1}{8}$ inch, nearly straight on the upper edge, indented by the five to seven divisions along the lower, downy,

where ripe curved and reflexed in a dense spike below the younger still open flowers. Remarkable for its very silky-brown buds and young leaves. **t. 123.** Wight Ic. t. 984, Ill. t. 79.

Very common in thickets on the Pulney and the Nilgiris downs; flowers summer. Kodaikanal, Ootacamund, Coonoor, Kotagiri, Bisccapatti, Kodanad, Pykara and lower levels, Shevaroys, but not on the ghauts to the further north.

Gen. Dist. Also Ceylon where plants are less thickly covered but hairs long.

Desmodium scalpe *DC.*; *F.B.I.* ii 165, L 16. Stem woody, slender, young parts pubescent. Stipules $\frac{1}{4}$ to $\frac{1}{2}$ inch, lanceolate acuminate, glabrous except on the margin, closely appressed to the stem. Leaf-stalk 2 inches hairy. Leaflets three, 1 to 3 inches wide; the middle one rhomboid; lateral oblique; stalks $\frac{1}{4}$ inch. Flowers small in lax terminal racemes or panicles, up to 12 inches. Bracts deciduous; pedicels very slender, usually in pairs, sloping up. Calyx $\frac{1}{8}$ inch. Corolla $\frac{1}{3}$ to $\frac{1}{2}$ inch, red. Pod of one to three half-diamond-shape joints, $\frac{1}{4}$ to $\frac{1}{3}$ inch long, with upper suture slightly curved. **t. 124.** Wight Ic. 985.

Nilgiris: near Ootacamund. Pulney at lower levels. Shevaroys.

Gen. Dist. Usually at lower levels on the hills of South India. Also tropical Africa, Abyssinia, Natal, Mascarene islands. Varies to a certain extent, leaflets acute or blunt, with entire or sinuate-crenate margin.

Desmodium parvifolium *DC.*; *Wall. Cat.* 5700 *!*; *F.B.I.* ii 174, L 47. Stems (main branches) pubescent in the younger parts, glabrous and often red in the older, $\frac{1}{20}$ inch thick. Lateral branches numerous, sticking out stiffly at right angles, leafy from the base to the flowering part. Stipules finely pointed, up to $\frac{1}{3}$ inch hairy, persistent after the leaf has fallen, e.g., at the base of a branch.

Leaves reflexed close to the axis, of one or pinnately of three leaflets; leaflets ovate, obtuse mucronate, with reticulate translucent veins; the terminal largest, $\frac{1}{8}$ to $\frac{1}{3}$ inch long; the lateral smaller; stalks not longer than the stipules. Racemes terminating the lateral branches, slender as a hair, pubescent: bracts ovate, boat-shaped deciduous; pedicels up to $\frac{1}{2}$ inch. Sepals $\frac{1}{10}$ to $\frac{1}{8}$ inch, slender pubescent, the calyx tube a quarter as long; Corolla blue, pale, purple or pinkish, not much exserted, keel rounded. Fruits on slender erect stalks $\frac{1}{2}$ by $\frac{1}{8}$ inch, three to five jointed by indentations on both edges; the joints opening on the top edge only, obscurely reticulately veined, pubescent, with the calyx persistent at the base. **t. 125.**

Quite common on the higher downs in grass and still more so at lower levels. Flowers March to October.

Gen. Dist. India on the hills: Simla, Nepal, 4,000 to 6,000 feet; Khasia, 3,000 to 5,000 feet; Nilgiris, Pulneys 7,000 feet; Ceylon, not in the Bombay Presidency (C.B.F.); Java and New Guinea, 6,000 feet. The "Everywhere in the plains" of F.B.I. lc. appears to be incorrect.

Desmodium rotundifolium *Baker; F.B.I.* ii 172, L 40. A small plant with very slender stems and younger branches covered with sticky hairs. Leaves of one or of three leaflets intermixed, the lateral leaflets much smaller than the middle one, which varies from $\frac{1}{4}$ to 1 inch, and is nearly round; stipules, petioles and margin of leaf with long brown hairs. Racemes, slender terminal: pedicels often in pairs, very slender $\frac{1}{2}$ to 1 inch, erect. Sepals strongly veined and shaggy with brown hairs, Corolla pink. Pod distinctly constricted between the seeds.

Nilgiris: on the downs on moist hill-side. Flower September. Also on the Western Ghauts at 3,500 feet. I cannot find any reference to this in *G.F.M.P.*

Gen. Dist. Plains of Concan (F.B.I.).

VICIA. F.B.I. 50 LIII.

Vetch.

Slender-stemmed herbs with pinnate leaf, part of which is transformed into a branched tendril by which the plant climbs: stamens diadelphous oblique at the mouth: pod dehiscent not jointed.

A large genus of 100 species scattered widely over the north temperate regions and also in South America. England has nine species.

Vicia sativa *Linn.; F.B.I.* ii 178, LIII 9; common Vetch. A slender-stemmed herb, climbing by branched tendrils, and having reddish or bluish purple flowers, solitary or in pairs at the leaf-axils. Stipules rather large and coarsely toothed, leaflets four or more pairs in each leaf, less than an inch in length variable in shape but usually oblong, narrowed to the base and cut off abruptly at the apex or indented, with a conspicuous mucro, otherwise entire. Flower stalk $\frac{1}{4}$ inch. Calyx tube campanulate: teeth as long, slender, subequal. Corolla well exserted, $\frac{3}{4}$ to 1 inch across: petals narrow. Pod $1\frac{3}{4}$ inches by $\frac{1}{6}$ inch straight, pointed: seeds seven to ten globular. **t. 126.**

An introduction from Europe, where it is cultivated for forage and so has spread widely over the temperate parts of the world; *Fr.* Vesce cultive, *Ger.* Futterwicke.

The flower has a simple pistol mechanism for the presentation of pollen to insect visitors. The anthers open inside the keel and shed their pollen into its tip. When a fairly heavy insect, such as a bee, alights on the flower it depresses the keel and in consequence pollen is pushed out of the end by the hairs on the style. In older flowers the stigma hits the insect's body in the same place and being receptive takes pollen from it.

The name is an old Latin one.

SHUTERIA. F.B.I. 50 LVI.

Slender herbs with pinnately trifoliate leaves, racemes of flowers, and flat curved pods.

Species under 10, Indian and tropical Africa.

Shuteria vestita *W. & A.; F.B.I.* ii 181, LVI 1. Stem slender twining hairy, leaflets ovate mucronate, stipules scarious. Flowers purplish. Seeds brown. **t. 127.**

Nilgiris, Pulneys and Shevaroys: 2,000 to 6,000 feet.

Gen. Dist. Sikkim and Khasia to South India and Ceylon.

DUMASIA. F.B.I. 50 LVII.

Slender-stemmed twining plants with pinnately three-foliate leaves distinguished by the calyx with bulging base and oblique truncate mouth (hardly any teeth); the standard petal with two spurs at the base; the style long and flattened above the curve, and capitate stigma. Flowers yellow.

Species three only, India, South Africa, Malaya and Japan.

Dumasia villosa: *F.B.I.* ii 183, LVII 1. A climber with pinnately three-foliate leaves; short racemes of flowers with long and almost toothless calyx out of which pokes the yellow corolla; and velvety pod contracted between the seeds.

Stem slender, twining, thickly coated, as also the stipules, leaf-stalks, undersides of leaflets, calyx and pod with short yellowish hairs. Stipules $\frac{1}{6}$ inch acute; petiole 1 to 2 inches. Leaflets nearly equal, ovate, obtuse, mucronate, glabrous above, when young ciliate; middle stalk $\frac{1}{2}$ inch, lateral $\frac{1}{8}$ inch. Racemes 2 to 4 inches, few

flowered: peduncle slender, 2 inches or more, in *var.* Congesta, very much shorter. Calyx $\frac{1}{3}$ inch bulging forwards at the base and narrowed to the very oblique mouth. Corolla exserted $\frac{1}{2}$ to $\frac{3}{4}$ inch, hanging with the small round standard downwards: wings obovate, curved downwards, adhering slightly to the keel which is shorter, and has slender claw longer than the oval blade. Style thickened suddenly at the bend, then thinner: stigma with radiating hairs. Pod enclosed at the narrow base by the calyx, contracted between the few seeds very velvety, opening by both edges. **t. 128.** Wight Ic. t. 445.

Quite common in sholas on the Ootacamund and the Kodaikanal downs.

Gen. Dist. Western Ghauts, above 6,000 feet but not common to the immediate north. (In the Bombay Presidency rare, only found by Cooke and at Mahabaleshwar) [C.B.F.].

Ceylon, Himalayas from Simla to Khasia and eastwards to Java, also in Madagascar and Natal.

MUCUNA.

Large climbing plants with pinnately three-foliate leaves and flowers in which the standard is only half as long as the keel, the anthers are alternately long and short, and the fruits (variable in shape) are covered with stinging hairs.

Species about 20, in the tropics.

Mucuna hirsuta *W. & A.; F.B.I.* ii 187, LX 7. Lateral leaflets obliquely ovate, about 3 inches by 2 inches, densely covered below with golden hairs. Flowers about $1\frac{3}{4}$ inches, reddish-purple. Fruits 2 inches by $\frac{1}{3}$ inch, S shape, densely covered with irritating hairs. **t. 129.**

Shevaroys: below "Lady's Seat," Yercaud. Pulneys: on the lower slopes.

CANAVALIA. F.B.I. LXX.

Twining plants with pinnately trifoliate leaves (of the bean type) which are not gland-dotted, and racemes of flowers in which the nodes are swollen more or less, the bracts small or caducuous ; calyx campanulate, the two upper lobes united into a very broad indented one, and the other three teeth very small ; corolla is well exserted and conspicuous, with large roundish standard, free at the base from the stamens, which are united (monadelphous); and large fattish pods with thickened or winged upper suture.

A small tropical genus, of Asia and America.

Canavalia virosa *W. & A. ; F.B.I.* as variety of C. ensiformis ii 196, LXX i. A large climber. Leaflets ovate-acute, hairy on the underside 2 to 3 inches long. Racemes long peduncled ; flowers 1 to 1½ inches pink. Pod 4 to 5 by 1 inch ; seeds about 7. **t. 130.**

Shevaroys : on the Nagalur plateau.

PHASEOLUS. F.B.I. 50 LXXIII.

Bean.

Twining plants with pinnately three-foliate leaves and axillary racemes of flowers characterized and distinguished by the keel being very long and coiled in a spiral ; the style also long and conspicuously bearded below the stigma ; and the pod long and narrow.

Species about 60, some widely cultivated, e.g., the French, Kidney and Haricot bean.

KEY TO THE SPECIES.

Both our species have yellow flowers and the stipulefixed above its base

Stem with stiff deflexed hairs ; leaflets 2 to 4 inches ; stipules $\frac{1}{5}$ inch ; pod glabrous. . . . . P. calcaratus.
Leaflets variable, usually small, lobed ; stipules large ; young pod silky . . . . P. sublobatus.

Phaseolus calcaratus *Roxb.* ; *F.B.I.* ii 203, LXXIII 12. Similar in habit to the next species, but the leaflets 2 to 4 inches broadly ovate, acuminate, scarcely ever lobed, and pods glabrous. Flowers yellow.

Nilgiri and Pulney Hills, to 7,000 feet.

Gen. Dist. Himalayas to Ceylon.

Phaseolus sublobatus *Roxb.* ; formerly P. trinervius *Heyne* ; *Wall. Cat.* 5603 ! ; *F.B.I.* ii 203, LXXIII 12. Stem and leaves hairy. Stipules ovate-acute, attached above their base. Leaves $\frac{1}{2}$ to $2\frac{1}{2}$ inches, ovate, more or less lobed. Stalks of racemes 3 to 6 inches ; flowering part 1 to $1\frac{1}{2}$ inches. Corolla yellow or reddish. Pod at first very silky, 2 to $2\frac{1}{2}$ inches long, 10 to 12 seeded, slightly curved.

A native of lower levels but found near Kodaikanal.

Gen. Dist. Plains of South India, Ceylon and Malaya.

The various cultivated beans—Lima, French or Haricot, Scarlet Runner and others—are cultivated varieties of this species.

VIGNA. F.B.I. 50 LXXIV.

Twining plants with the characters of Phaseolus but the keel not spirally twisted, and stigma oblique.

Species about 50.

Vigna vexillata *Benth.* ; *F.B.I.* ii 206, LXXIV 5. Leaflets ovate or lanceolate, acute. Flowers 1 inch or

more, reddish purple, 2 to 4 together on a long peduncle. Calyx strigosely hirsute. Pod 3 to 4 inches by $\frac{1}{4}$ inch with blackish hairs, with 10 to 15 seeds.

Nilgiris and Pulney Hills, up to 7,000 feet [*G.F.M.P.*].

Gen. Dist. Western Ghauts, South Kanara, Nilgiris and Pulneys. "Wynaad Sweet Pea."

Vigna Wightii *Benth.*; *F.B.I.* ii 206, LXXIV 7. A slender twiner, differing from the last species in the stem being hairy, the calyx softly villous, the petals with shorter claws, the leaflets obtuse mucronate, and the pod with brown hairs.

Pulneys, about 5,000 feet, below Shembaganur.

Gen. Dist. Western Ghauts, Wynaad, etc.

DOLICHOS. F.B.I. 50 LXXVII.

Twining herbs with pinnately three-foliate leaves, and minute sub-persistent bracts, bracteoles and stipules. Differs from Phaseolus in the keel not being spiral, the stigma terminal and the pod flat, slightly curved.

Species about 20, in the tropics of both worlds.

Dolichos lablab is cultivated on the plains for the pods which are eaten green like French Beans. D. biflorus *L.* is cultivated on the plains for its seeds (Horsegram).

Dolichos falcatus *Klein*; *F.B.I.* ii 211, LXXVII 6. A slender twiner. Leaflets entire or slightly three-lobed, $\frac{1}{2}$ to 1 inch. Stipules small, reflexed persistent. Flowers lilac or pink in colour, 2 to 8 on slender peduncles of about 2 inches. Calyx under $\frac{1}{4}$ inch. Corolla twice as long. Pod 2 to 3 inches by $\frac{3}{8}$ inch curved.

Shevaroys: Yercaud, etc. Pulneys: below Kodaikanal.

Gen. Dist. Himalayas to Ceylon, on the lower hills.

ATYLOSIA. F.B.I. 50 LXXIX.

Herbs or shrubs, erect or twining with pinnately three-foliate leaves; characterized by the flowers in pairs; all parts covered with small red resinous glands which however are concealed under short hairs; pods with depressed lines between the seeds; and the strophiole (aril) of the seeds large and divided.

Species about 20, India, Mauritius and to Australia.

Named from the Greek A, *without, and* TYLOS, *callosity, because the standard is without the hard basal knobs possessed by some genera.*

Shrub 2 feet . . . . A. trinervia.
Slender twiner running in grass. . . . . A. rugosa.

Atylosia trinervia *Gamble*; formerly Atylosia Candollei *Wight and Arnott; Herb. Wight Prop.* 1631 *!*; *F.B.I.* ii 212, LXXIX 1. Branches, leaf-stalks, undersides of leaflets, calyx, and more especially in the younger parts densely clothed with erect hairs: twigs stiff. Stem grooved, very hairy on the ridges between. Leaf-stalk ½ inch erect: internodes hardly longer so that the foliage is usually very dense. Leaflets elliptic or obovate-cuneate, 1 to 3½ inches by ½ to 1 inch; lateral somewhat oblique; terminal slightly larger; stalks about equal; pubescent on the upper side, densely so on the raised veins of the lower; distinctly sticky. Peduncles of the pairs of flowers erect, in the lower axils 2 inches, in the upper short to 0: pedicels ½ inch. Calyx ½ to ¾ inch densely silky, teeth two to three times the cup. Petals as long again, pure gamboge yellow: keel blunt without beak. Stamens all equal, upper one free. Pod very hairy, 1¼ by ⅜ inch, with a short abrupt point, surrounded at the base by the persistent calyx and corolla, and slightly indented between the three or four seeds. **t. 131**. Wight Ic. 754.

Nilgiris: Eastern and Western plateaus, flowering April-July. Common on land which has been cleared and left.

Gen. Dist. Western Ghauts. Also Ceylon.

The flowers face upwards with the keel erect and standard horizontal. The standard is bent back near its base, and there presses against two small points on the wing petals. These latter are attached to the keel. Honey can be got only by a stout proboscis pushed home between the standard and the wings. But the standard stiffened at this point by being bent, and supported also by the calyx behind it, remains firm, so that, the wings and with them the keel petals are pushed apart exposing the stamens.

The flowers have the smell of musk, the leaves a little that of the "Cedar-wood" of pencils. The petals fade a rich purple-terracotta colour beginning with the back of the standard, and remain for some time.

Atylosia rugosa *Wight and Arnott; Herb. Wight Prop.* 761 *!; F.B.I.* ii 215, LXXIX 12. Remarkable for its very slender stems running in grass and the very conspicuous veins of the underside of the small leaflets. Leaf-stalks ½ to 1 inch, erect, clothed like the young branches with brown pubescence. Leaflets ¾ inch; terminal one obovate-cuneate, lateral obliquely obovate; velvety on the upper side with impressed veins; white or almost orange below especially on the much-raised veins. Peduncles ¼ to 1½ inches, ¾ to 1 inch apart along leafless branches: pedicels ⅛ inch, bracts conspicuous, ⅙ inch ovate. Calyx ⅛ inch, teeth equal to the tube. Corolla ¼ inch, yellow; remaining for some considerable time, but not quite until the pod has ripened. Pod ½ inch by ⅛ inch, rounded at both ends except for the short stylar point, mostly one-seeded but also with two or three seeds, densely pubescent, brown, opening by both edges, the valve curling up when dry: if with two seeds divided inside between them. Seeds brown or purple, with a large double fleshy excrescence (strophile) on the hilum side, more than half as long as the seed itself. **t. 132.**

Pulneys: on the Kodaikanal downs, very common. Nilgiris: near Ootacamund, much less common. *Fyson* 1089, 1099, 1488. *Bourne* 1091, 2040.

Gen. Dist. South Indian hills and Ceylon. Not on the Bombay Ghauts to the north, nor apparently anywhere else in India.

The leaflets show very marked sleep-movements, folding along the mid-rib, and becoming nearly erect against the stalk at sundown. I have not detected any scent as in the other species.

RHYNCOSIA. F.B.I. 84.

Twining plants with pinnately three-foliate leaves, dotted on the underside with resinous glands, and usually axillary, racemes of flowers, with one or two seeds only in the flat or slightly turgid pod.

A fairly large genus of about 100 species everywhere in the tropics.

KEY TO THE SPECIES.

a { Flowers on axillary pedicels not racemed. Leaflets woolly below . . . . R. filipes.
Flowers few well separated on raceme; sepals broad, enclosing the shorter corolla. . . . R. rufescens. }

Flowers many on long spikes: sepals acuminate less than half the corolla . . . . R. viscosa.

Rhyncosia rufescens *DC.; F.B.I.* ii 220, LXXXIV 1. Shrubby, with long slender zigzag branches. Leaflets about 1 inch, terminal larger than lateral, broadly elliptic acute. Flowers on very slender peduncles, and pedicels distinctly separated. Sepal $\frac{1}{2}$ by $\frac{1}{8}$ inch. Corolla enclosed. Pod $\frac{1}{4}$ to $\frac{3}{8}$ inch, roundish with one seed.

Shevaroys: near Yercaud.

Gen. Dist. Plains.

Rhyncosia viscosa *DC.; F.B.I.* ii 225, LXXXIV 15. A stronger plant than the last, twining widely. Leaflets broadly ovate-deltoid, broader than long, acute.

Spikes up to 12 inches; flowers close; calyx and its teeth about $\frac{1}{3}$ inch. Corolla 1 inch. Pod $1\frac{1}{4}$ inches two-seeded.

Shevaroys: on the upper plateau in thin jungle.

Rhyncosia filipes *Benth.*; *F.B.I.* ii 221, LXXXIV 5. Stem very softly and densely hairy, as also underside of leaflets which are velvety on the upper side, and ovate-acute in shape. Flowering branches very slender and long, the nodes 2 to 4 inches apart. Flowers solitary on very slender pedicels of $\frac{1}{4}$ to 1 inch in length, small. Pod $\frac{3}{4}$ by $\frac{1}{6}$ inch densely pubescent, two-seeded.

Nilgiris: at low levels. Pulneys: Pillar rocks and below. Shevaroys: on plateau.

FLEMINGIA. F.B.I. 50 LXXXV.

Leaflets three, gland-dotted below and equally stalked or one only. Flowers yellow in dense spikes or clover-like heads, stipules and bracts large and conspicuously striate. Pods turgid not divided between the seeds, and seeds without strophiole. No stipels to the leaflets.

Species about fifteen, nearly all Indian.

Erect herb or undershrub, leaflets up to 3 inches . . . . F. Grahamiana.
Trailing herb, leaflets $\frac{3}{4}$ inch . . . . . F. nilgheriensis.

Flemingia Grahamiana *Wight and Arnott*; *Wight Herb. Prop.!*; *F.B.I.* ii 228, LXXXV 6. Shrubby, stem erect, finely striate; young parts tomentose. Petioles 1 inch with narrow wing, when young closely erect against the stem. Terminal leaflet 2 to $3\frac{1}{2}$ inches by 1 to $2\frac{1}{2}$ inches, obovate-cuneate, with three main veins, the middle one pinnately branched,

the lateral one more closely so on their insides than on the outsides, recalling the venation of ZIZYPHUS; lateral leaflets oblique, venation similar but inside lateral vein absent or not well marked; all acute entire, equally and shortly stalked, hairy on the veins on the lower side, and dotted with glands; when in bud erect, folded between the shaggy veins, then horizontal, later hanging perpendicular from erect petioles, then rising as they unfold and the petioles spread outwards. Spikes very dense, oblong, 1 to 2 inches; bracts $\frac{1}{4}$ inch, ciliate, acute. Flowers pink. Calyx teeth hairy round the edges. sprinkled with black glands. Corolla small, not exserted yellow. Pod short and stout, under $\frac{1}{2}$ inch by $\frac{1}{4}$ inch, finely pubescent and covered with clammy red glands. **t. 133.**

Pulneys: on the Kodaikanal downs, extremely common, where in summer the young shoots are conspicuous above the herbage, for their horizontal folded leaves. Flowers October and November. *Fyson* 1129, 2151. *Bourne* 45, 402.

Nilgiris: Coonoor. Shevaroys: Lady's Seat near Yercaud.

Flemingia nilgheriensis *Wight, Manuscript in Herb. Kew!; F.B.I.* ii 230, LXXXV 10 *; formerly F. procumbens *var.* Stem and branches many, 12 to 18 inches, spreading on the ground, terete, clothed as also the leaf-stalks and calyx with long spreading hairs and sprinkled with dark red glands. Petioles $\frac{1}{4}$ inch to $\frac{5}{8}$ inch, leaflets equally subsessile, rounded at the end, mucronate, pinnately veined, middle one obovate, cuneate, lateral more oblong and oblique. Heads of flowers terminal about $\frac{3}{4}$ inch across, peduncled $\frac{1}{2}$ to $1\frac{1}{2}$ inches above the last leaf, but often with a pair of stipule-like bracts $\frac{1}{6}$ inch below; bracts $\frac{1}{3}$ by $\frac{1}{10}$ inch lanceolate acute,

hairy. Calyx densely hairy, the hairs often springing from large yellowish bulbous bases, and with also small dark-red glands ; teeth more than twice the tube, linear lanceolate, shaggy especially round the edges. Corolla yellow, not much exserted, purple ; standard hairy and glandular on the back, auricled. Pods $\frac{1}{5}$ inch, shorter than the calyx, ovoid or sub-globose, pointed, glabrous, veined ; seed one only as a rule, ellipsoid, quite filling the pod, dark brown, smooth. t. 134. Wight Ic. 987.

Pulneys : Lidcot valley near . Kodaikanal on rocks and elsewhere. *Bourne* 893. On the Nilgiris on the western downs. Pykara, Naduvattam, flowering September. Confined to the Western Ghauts to the Bababoodons but rare in the Bombay Presidency.

In the F.B.I. this was placed as a variety of F. vestita, *Benth* apparently because named by *Wight* F. procumbens by a slip which he corrected in a manuscript in the herbarium at Kew while F. procumbens *Roxb.* = F. vestita *Benth.* The plant is restored to specific rank by Cooke in the Bombay flora, from which this explanation and the description of the pod is taken.

DALBERGIA. F.B.I. 50 LXXXVI.

Trees and large woody climbers with pinnate leaves of alternate leathery leaflets, panicles of numerous small flowers, in which the anthers are small and fixed back to back on their filaments and open by a vertical slit ; and thin flat indehiscent pods containing one or more seeds, but not winged.

Species about 70, in the tropics.

Dalbergia latifolia *Roxb.* and D. sissoides *Grah.* are the trees whose wood is usually called " Rosewood " in S. India.

The Indian species were monographed by D. (now Sir David) Prain in the Annals of the Royal Botanic Gardens, Calcutta, Vol. X.

Dalbergia congesta *Roxb.* ; *F.B.I.* ii 232, LXXXVI 8, in part. Leaflets 1 by $\frac{1}{2}$ inch, elliptic or obovate,

obtuse, notched. Flowers in small cymose panicles, in the leaf-axils, about $\frac{1}{4}$ inch only. Pod 1 to 2 inches by $\frac{3}{4}$ inch, with one oblong seed in the middle.

Nilgiris : On the Ghaut Road below Coonoor, etc.

Dalbergia Gardneriana *Benth. ; F.B.I.* as part of the last. Like D. congesta, but the branches and undersides of leaflets covered with dense brown tomentum, the leaflets elliptic-oblong, not notched and the panicles more contracted.

Nilgiris : Coonoor and just below.

In the *F.B.I.* these last two species were united.

PTEROCARPUS. F.B.I. LXXXVII.

Trees. Leaves of 3, 5 or 7 alternate leaflets. Flowers in axillary panicles, yellow, showy : petals crinkled stalked. Ovary with 2 ovules, but pod as a rule with one seed only, flat, roundish with a broad wing, not opening.

Species about 20, in the tropics of the whole world.

Pterocarpus santalinus *Linn. f.; F.B.I.* ii 239, LXXXVIII 3. "Red Sanders." Leaflets 3 roundish-oblong, obtuse or apex notched, veins numerous and close. Flowers $\frac{3}{4}$ inch, yellow. **t. 135.** Bedd. Fl. Sylv. t. XXII.

Shevaroys : On the Nagalur road, flower June.

Gen. Dist. Deccan, Cuddapah Hills to Chingleput, etc., at 1,500 feet. Properly belongs to these latter lower levels.

DERRIS. F.B.I. 50 LXXXIX.

Large climbers with imparipinnate leaves with opposite leaflets and showy panicles of small flowers fascicled along the spike or branches of the panicle. Calyx teeth

very short. Corolla much longer. Pod thin, indehiscent, with a few flat seeds.

Species about 50, in the tropics.

Derris canarensis *Baker ; F.B.I.* ii 246, LXXXIX 21. Leaflets about 7, broadly ovate, acuminate, 1½ to 2 inches by 1 inch. Spikes of flowers erect, 3 to 6 inches, three or four together fascicled or on very short peduncles in the leaf-axils, rachis brown. Flowers fascicled. Pedicels about 1/6 inch. Calyx 1/8 inch, brown. Corolla nearly ½ inch longer, white. Standard strongly reflexed ; keel obtuse ; wings shorter. Pod not seen. **t. 136.** Trim. El., Ceylon, t. xxix.

Pulneys : Kodaikanal near the junction of the upper and middle lake roads. *Fyson* 4205.

I name this from the illustration in Trimen's Flora, though the flowers are shown there as pink, for in all other respects it seems to agree with that figure. But if this is correct the species attains a higher elevation than has been supposed, for Gamble in *F.M.P.* gives its locality as in evergreen forests and along backwaters. It should then probably be considered a highland white flowered form of the species.

SOPHORA. F.B.I. 50 XCII.

Shrubs with pinnate leaves, very small calyx teeth, stamens all free (an unusual thing in this family), and the pod constricted between the seeds and usually not opening.

Sophora glauca *Leschenault ; F.B.I.* ii 249, XCII 4. A shrub with soft greyish green foliage and dense spikes of small purplish flowers. Height 6 to 12 feet ; branchlets round densely pubescent. Leaflets ten to fifteen pairs plus a terminal one, ½ by 1/5 inch, oblong, obovate-elliptic, blue-green or olive-green, softly hairy on both sides, with strong midrib produced as a mucro. Flowers in dense terminal racemes with small and very quickly

falling linear bracts and bracteoles. Calyx $\frac{1}{4}$ inch long and broad, with small but distinct teeth, pinkish purple. Corolla twice as long, standard purple, keel white. Pedicels erect $\frac{1}{8}$ inch, petals with long claws, equal: standard obovate, $\frac{1}{4}$ inch broad, notched: wings oblong: keel petals overlapping at the back but scarcely united. Pod cylindrical with a stalk of $\frac{1}{4}$ to 1 inch and equally long point, constricted between the seeds which if few may be far apart, very densely velvety. Seeds one to six, almost perfectly ovoid except for a swelling near the small hilum, polished, light coloured. **t. 137.** Wight Ic. 1054 ex. pods.

Nilgiris: On the open downs especially dry hill-sides near Ootacamund, in flower all the year round, and down to Pykara, Kotagiri, Biccapatti and Coonoor. Shevaroys: near Yercaud. Not collected on Pulneys.

Gen. Dist. Western Ghauts, Peermade, the hills of Western India, but apparently somewhat local, and not on the ghauts of the Bombay Presidency.

The leaves have a rank smell when bruised, somewhat like that of the English Elder, and on drying turn black. The flower is much compressed, the standard being folded round at the base and leaving a small tubular opening above the upper edge of the keel and wings. Partly because of this folding but also of its thickness, the standard is very stiff, and is made more so by the support of the upper calyx lobe. The keel and wings are free of each other but small projections at the base of the latter fit into hollows in the wings so that they must move together. A heavy insect pushing its way down the tubular opening between the firm standard and the wing petals would necessarily force the latter down and with them the keel and so come into contact with the anthers, held in place as these are by their stiff filaments. The flower thus appears adapted for visits by short-tongued bees.

CÆSALPINEÆ.

In this family (or sub-order) of the LEGUMINOSÆ the petals are nearly equal and similar, the uppermost is inside the others in bud and often much the smallest,

the stamens are all free of each other, and typically ten but often reduced to seven or fewer. In other respects it is as given under LEGUMINOSÆ, p. 132.

The pod varies—it may be flattish and open by both edges (as in the Papilionaceæ) or by the upper edge only, or be cylindrical and break open irregularly; or again it may be constricted between the few seeds and break up into one-seeded parts, or have only one seed, and be compressed above it into a wing by which it is distributed down the wind.

The family is one of warm climates and consists of trees and shrubs. Many are cultivated for their beautiful flowers, e.g., Cæsalpinia (Peacock flower), Poinciana (Gold mohur), Cassia (Indian laburnum and other species), Amherstia and Bauhinia. Another well-known member is the Tamarind. On these elevations most of the species of Cassia are introduced garden plants, run wild.

KEY TO THE GENERA.

Leaves bipinnate, thorny shrubs . . . . . CÆSALPINIA.
Leaves pinnate. . . . . CASSIA.

CÆSALPINIA. F.B.I. 50 XCVI.

Trees, shrubs or woody prickly climbers with bi-pinnate leaves and showy yellow flowers in axillary racemes. Calyx of five almost free sepals, the lowest and largest of which is spoon-shaped. Petals roundish sub-equal with distinct claw. Stamens 10, bent down a little. Pod thin or turgid, dehiscent or not.

Species about 50 in the tropics.

Cæsalpinia pulcherima *Swartz*, the Peacock flower of the Chinese, or Barbados hedge, with large orange red flowers, is almost universal in Madras gardens.

Cæsalpinia sepiaria *Roxb.* ; *F.B.I.* ii 256, XCVI 6 ; the Mysore thorn. A very prickly straggling shrub. Branches more or less covered with grey or brown pubescence and small hooked prickles. Leaves 9 to 12 inches long, of 12 to 20 pinnae, each with 16 to 24 leaflets, ½ to 1 inch long, green on the upper side, glaucous on the under. Corolla 1 inch across, pale yellow, facing sideways or down, on ascending pedicels of 1 to 1½ inches. Stamens about ⅝ inch, anthers red. Pod 3 by 1 inch, reddish brown, stout and woody, with a very narrow wing along the upper edge ; open pod horizontal boat-like, with about 6 brown-grey mottled seeds. **t. 138.** *Vern.* Chillari.

Nilgiris, on the Eastern plateau : Biccapatti mund, 6,500 feet, below Coonoor on the ghaut road and towards Kodanad. Pulneys, at Vilpatti about 6,500 feet.

CASSIA. F.B.I. 50 CIII.

Herbs, shrubs and trees. Leaves even-pinnate, with one or more glands on the rachis. Flowers usually yellow and showy ; sepals five, on the *margin of a short and* scarcely hollowed calyx tube ; stamens ten, but often only seven of the anthers fertile, some at least of these opening by pores or short slits.

A large genus of 300 to 360 species, inhabitants of all tropical countries, and divisible into four well-marked subgenera, *according to the number* and dehiscence of the fertile anthers, the nature of the pod and the lie of the seeds in it, the general habit and the arrangement of the flowers.

Monographed by G. Bentham in Trans. Linn. Soc., Vol. xxvii (1871).

KEY TO THE SPECIES.

a { Leaflets 30 to 40 pairs : a *small spreading undershrub.* C. mimosoides.
Leaflets 16 to 24 pairs : pod hairy . . C. Leschenaultiana.
Leaflets 3 to 10 pairs : shrubs or trees . . . . . . *b*

b { Stamens 10, 3 lower anthers larger . . C. FISTULA.
Fertile anthers 7, 3 upper sterile c
Glands on the leaf-stalk between all or most of the leaflets . . . .
One gland only at the base of the leaf-stalk. C. occidentalis. }

c { Leaflets glabrous . . . . C. lævigata.
Leaflets tomentose underneath . . . . C. tomentosa. }

Cassia Fistula *Linn.*; *F.B.I.* ii 261, c 111 I; the Indian Laburnum. Stamens all with anthers, but 3 lower largest. A medium sized tree. Leaflets 4 to 8 pairs 2 to 5 inches long, narrowed at the apex. Flowers 1 to 2 inches across, in large pendent racemes, pale yellow. Pod 1 to 2 feet by 1 inch, cylindrical. t. **139.** Wt. Ic. t. 269.

Shevaroys: on the Nagalur Road, apparently wild, but frequently planted.

Gen. Dist. Central Himalayas to South India, Ceylon, Malaya and China. Commonly planted.

Cassia occidentalis *Linn.*; *F.B.I.* ii 262, CIII 5. A low undershrub with foliage and inflorescence of C. lævigata except for the solitary gland on the leaf-stalk near its base; and pod when ripe flat, 4 inches by ¼ inch with prominent sutures thicker than the rest of the pod. Leaflets 3 to 5 pairs, ovate acuminate. Flowers rich yellow. Fertile stamens 6 or 7. Seeds flattened at right angles to the pod and parallel to the division walls, except sometimes in the upper part of the pod they are parallel to the sides.

A native probably of tropical America and introduced elsewhere. Now abundant in waste and cultivated places in tropical Asia and Africa.

Cassia lævigata *Willd.* A handsome shrub with golden yellow flowers in terminal corymbs of axillary racemes, distinguished by the acute or acuminate

dark green glabrous leaflets, with a cylindrical pointed gland between the two of every or all but the terminal pair. Branches round, smooth. Stipules $\frac{1}{4}$ inch but often falling early. Leaves from 4 to 8 inches, the lowest pair of leaflets $1\frac{1}{2}$ to 2 inches from the branch. Leaflets lanceolate, from 1 to 5 inches, the terminal pair usually the largest, from long. Flowers over an inch across. Three upper stamens sterile, next four with anthers $\frac{1}{8}$ inch, the next pair with filaments longer than the lowest one and anthers, like the latter, $\frac{1}{4}$ inch curved ; all these opening by pores at the top, and having a line of pubescence down the middle line on each side, which however soon withers. Pod brown, $3\frac{1}{2}$ to $\frac{1}{3}$ inch, thick, opening elastically along one edge, segmented inside and indented between the seeds. Seeds horizontal with short stalks. **t. 140.**

A native of tropical America, Brazil to Mexico, and now wild, but probably introduced, in similar parts of Asia and Africa.

Cassia tomentosa *Linn.* ; *F.B.I.* ii 263, CIII 7* ; the Yellow Cassia of Ootacamund. A small tree or shrub, with large panicles of buttercup-yellow flowers. Young branches, sepals, ovary and the underside of leaves densely covered with short hairs. Leaflets six to eight pairs, oblong obtuse, pubescent on the upper side and dark-green, 1 to $1\frac{1}{4}$ by $\frac{1}{4}$ inch, prominently one-nerved, with a gland between the two of all or most pairs, densely pubescent on the underside. Racemes of flowers in the upper axils ; stamens as in C. lævigata. Pod 4 by $\frac{1}{4}$ inch tomentose. **t. 141.**

Nilgiris : in Ootacamund very common by roadsides and flowering abundantly. Pulneys : at Poombari.

A native of tropical America in the valleys of the Andes from Bolivia to Central America.

Cassia mimosoides *Linn.; F.B.I.* ii 266, CIII 18; Pink or Yellow Ground-Cassia. A low diffuse perennial with slender downy branches. Stipules $\frac{1}{6}$ inch acute. Leaves 1 to 2 inches; leaf-stalk hairy, with one gland on below the lowest pair of leaflets, and produced beyond them in a soft spine; leaflets thirty to fifty pairs, $\frac{1}{8}$ by $\frac{1}{30}$ inch linear, mucronate with a red outer margin. Flowers solitary, pedicelled in the leaf-axils; sepals $\frac{1}{4}$ to $\frac{1}{3}$ inch linear. Petals about as long. Stamens ten, filaments short; anthers alternately long and short, and opening by terminal slits. Pod flat, $1\frac{1}{2}$ to 2 inches by $\frac{1}{6}$ inch, the partitions inside oblique nearly or quite glabrous.

In woods and on shady roadsides. Nilgiris: Ootacamund, Coonoor.

Gen. Dist. Tropical Asia, Africa and Australia. Rare in America.

Cassia Leschenaultiana *DC.* Similar in habit to **C. mimosoides** *Linn.* but with only 16 to 24 pairs of leaflets and the pods hairy, not glabrous. **t. 142.**

Nilgiris: Coonoor, etc. Pulneys: Shembaganur, etc.

Cassia didymobotrya *Fres.* A handsome shrub with large brown bracts under the flowers is grown often in gardens in Coonoor. Native of Africa.

MIMOSEÆ.

In this family (or sub-order) of the LEGUMINOSÆ the flowers are small and massed in small dense heads or short spikes; the petals all equal, often united at the base, and in bud valvate (none overlapping another); the stamens may be ten or very many. In other respects the family is as given for the LEGUMINOSÆ, p. 132, but in many of the ACACIA genus the leaves are apparently simple, being only the flattened petiole.

KEY TO THE GENERA.

Stamens 5 only. Tall tree . . . . ACROCARPUS.
Flowers pink, stamens 10, low undershrub . . . MIMOSA.
Flowers yellow or white in globular heads. Leaves in some simple. Stamens many . . . . ACACIA.
Flowers in thick spikes, pod very broad . . . ALBIZZIA.

MIMOSA.

Herbs and shrubs with bi-pinnate, often sensitive, leaves ; and globular heads of small flowers with 4 or 5 triangular lobes to the corolla, as many or twice as many stamens, their anthers not crested ; and oblong pods.

About 300 species chiefly of the American tropics.

The word MIMOSA has been used in popular language to cover a number of widely different plants.

Mimosa pudica *Linn.* ; *F.B.I.* ii 291, CXXV 1. ; the sensitive plant. Stem and branches slender, armed with recurved prickles. Leaf-petiole 1½ to 2 inches, pinnas 2 or 4 nearly sessile, and attached close together, 1½ inches ; ultimate leaflets 12 to 20 pairs, $\frac{1}{6}$ to ¼ inch long.

Shevaroys : about Yercaud, common roadsides and often a troublesome weed.

The leaflets may be made to close one by one by touching them gently. Violent stimulus will cause all to close and the pinnas to drop down ; and this reaction may spread to all the leaves of a plant, and by the movement to other plants also. A. R. Wallace suggested that this served to protect the leaves from grazing animals.

ACROCARPUS.

Acrocarpus fraxinifolius *Wight* ; *F.B.I.* ii F.B.I. 50 CXXVI 292, CXXVI 1. A lofty unarmed tree. Leaves doubly pinnate of about 5 pinnae 12 inches long, each of about 8 pairs of leaflets. Leaflets 2½ to 3½ inches by 1¼ to 2 inches, obovate, cuspidate, entire, glabrous.

Flowers in stiff spikes 5 to 10 inches long. Calyx $\frac{1}{4}$ inch, shallow-cup shaped. Corolla $\frac{1}{2}$ inch, cream-coloured stamens 10, filaments red very conspicuous. Pod flat, winged along the upper edge.

Nilgiris: Coonoor possibly only planted, at bridge at foot of Tiger Hill Road, Sims Park, etc. Flower March-April.

Gen. Dist. Lower levels on these hills.

ACACIA. F.B.I. 50 CXXVII.

Wattle, etc.

Flowers small in yellowish balls $\frac{1}{4}$ inch across ; calyx campanulate $\frac{1}{16}$ inch ; petals four or five united in the lower half ; stamens many.

Species over 400. More than half Australian, the others in the tropics.

In many Australian species the leaves are apparently simple. Seedlings however all begin with bi-pinnate leaves, and the apparently simple leaf is really a broadened leaf-stalk of which the pinnas and leaflets have not developed : they are known as *phyllodes*. It will be seen that the veining of these is not like that of an ordinary leaf.

There are no species indigenous to these levels, but three or four introduced from Australia are now well established in and near hill stations.

KEY TO SOME OF THE INTRODUCED SPECIES.

a { Leaves apparently simple . . . . *b*
Leaves bi-pinnate ; leaflets forty to fifty pairs on each of eight to fifteen pairs of pinnas . . . . *c*

b { Phyllode with one main nerve and many slender side-veins . . . . A. retinodes.
Phyllode with 2 nerves only . . . . . . A. longifolia.
Phyllode with three or four main nerves and very slender parallel veins . . . . A. melanoxylon.

c { Foliage green, young shoots golden. Flower-heads pale, yellow. Pod distinctly constricted between the seeds. A. decurrens.
Foliage bluish, young parts not yellow. Flower-heads golden yellow. Pod not constricted. . A. dealbata.

Acacia melanoxylon *R. Br.*; *Benth. Fl. Aust.* ii 388; CXXVII **; Black-wood of Australia. Planted everywhere on these levels. Native of New South Wales, Victoria, Tasmania and South Australia. Flowers October. Styles often long exserted, seeds black with long red funicles. **t. 143.**

Acacia decurrens *Willd.*; *Benth. Fl. Aust.* ii 414; CXXVII ***; Green or Black Wattle of Australia. Planted. Native of South Australia, Tasmania, Victoria, New South Wales. Flowers: Kodaikanal, March-April, Coonoor early summer.

Acacia dealbata *Link*; *Benth. Fl. Aust.* ii 415; CXXVII *****; Silver Wattle of Australia. Native of New South Wales, Tasmania, Victoria. Flowers: Ootacamund, September. **t. 144.**

The above are the commonest species planted.

Acacia longifolia *Willd.*; *Benth. Fl. Australiensis* ii. 397. A shrub or small tree. Branchlets angular, glabrous. Phyllodes very nearly straight, about 3 inches by $\frac{1}{4}$ inch; nerves 2 or more parallel from the base with reticulations between. Flowers in spikes of about 1 inch, 2 or 3 in an axil. Petals 4. Pod 2 to 4 inches narrow, constricted often between the seeds which lie lengthwise in the pod and have their stalk (funicle) thickened into a short cup-shaped aril. **t. 145.**

Nilgiris: at Coonoor planted.

Gen. Dist. Native of Australia from Moneton Bay, Queensland, to the Brown River in S. Australia.

Acacia retinodes *Schlecht*; *Benth. Fl. Aust.* ii 362, CXXVII*. A native of Victoria and South Australia.

ALBIZZIA. F.B.I. 50 CXXVIII.

Like ACACIA but sepals and petals always five each ; stamens numerous, united at the base in a tube ; pod very broad and thin ; seeds compressed, their stalks slender.

Species 25 to 30, in the tropics of Africa, Asia and Australia. In India ten, one of the commonest being *A. Lebbek*, grown in Madras.

Albizzia lophantha *Bentham ;* CXXVIII 10 *. A shrub or small tree with bi-pinnate leaves of very small leaflets, and remarkable for its thick axillary spikes of small flowers and thin flat pods. Branches, leaf-stalks and peduncles usually velvety. Pinnas eight to ten pairs ; leaflets twenty to thirty, or more pairs, $\frac{1}{4}$ inch long, narrow, with the vein near the upper margin ; silky pubescent underneath. Flower-spikes, $1\frac{1}{2}$ to 3 inches long by $1\frac{1}{4}$ inches thick when the flowers open because of the long stamens ; pedicels $\frac{1}{6}$ inch. Pod $3\frac{1}{2}$ inches by $\frac{3}{4}$ to $\frac{1}{2}$ inch, thin, the valves not twisting up after opening.

A native of western Australia but planted and now naturalized on the Nilgiris and one tree in Bombay shola near Kodaikanal.

ROSACEÆ.

Herbs, shrubs or trees with alternate, stipulate, simple or leathery leaves, and quite regular flowers of five free sepals, with occasionally an *epicalyx* of five bracteoles below them ; five free rounded petals attached to the margin of a cup-shaped or ring-shaped honey-secreting disc ; numerous stamens bent inwards in bud, with small anthers ; and one or more carpels, with one or more seeds in each.

The centre of the flower may be raised and the carpels separate, ripening into (dry) achenes as in the Strawberry where the *torus* (centre) becomes juicy, or into juicy berries enclosing each one small stone as in the Raspberry; or may be nearly or quite flat with one carpel only which ripens into a stone fruit, as in the Plum, Cherry and Apricot; or be hollowed and enclose a few one-seeded carpels, as in the Lady's mantle and Agrimony; or have many carpels which lie free inside what is eventually a more or less juicy case (*calyx tube*), as in the Rose; or the carpels may be completely sunk in a juicy fruit, with the seeds inside hard stones as in the Hawthorn, or in horny cases as in the Apple and Pear. All these variations in the fruit are met with in our flora.

Species over 1,000 all over the world but mostly in temperate climates and the countries surrounding the Pacific Ocean.

KEY TO THE GENERA.

A. Carpels superior.

(*a*) Carpel one only.

Petals and sepals small, hairy; fruit transversely oblong . . *p.* 189. PYGEUM.

Petals $\frac{1}{4}$ inch white: spiny shrub . . *p.* 190. PRINSEPIA.

Petals large, pink or white; no spines (Peach, etc.) . . . *p.* 189. PRUNUS.

(*b*) Carpels many.

Carpels in fruit fleshy on a dry centre (Raspberry) . . . . *p.* 191. RUBUS.

Carpels in fruit dry on a fleshy centre (Strawberry) . . . *p.* 196 FRAGARIA.

Carpels dry, centre dry . . . . . . *p.* 197. POTENTILLA.

B. Carpels inferior.

(*a*) Fruit leathery, hollow, enclosing many hairy achenes . . *p.* 199. ROSA.

(*b*) Fruit fleshy, under ½ inch.

Trees with corymbose panicles of small flowers . . . *p*. 200. PHOTINIA.

Low shrub with small leaves . . . *p*. 202. COTONEASTER.

(*c*) Fruit fleshy 1 inch or more.

Flowers in fascicles (Pear, etc.) . . . . . . *p*. 204. PYRUS.

Flowers in pyramidal panicles, leaves white underneath . . . *p*. 203. ERIOBOTRYA.

PRUNUS. F.B.I. 51 III.

Ovary superior. Seeds enclosed in a hard endocarp ('stone') surrounded by the fleshy mesocarp. No wild species.

Prunus Persica *Benth and Hook.* Leaves narrowly lanceolate, finely serrate ; petiole with glands ; stipules fimbriate. Flowers pink, sessile. Fruits smooth (Nectarine) or downy (Peach).

Cultivated on the Shevaroys, etc.

PYGEUM. F.B.I. 51 V.

Evergreen shrubs and trees with small greenish, often imperfect flowers in axillary racemes. Petals and sepals hardly distinguishable, very small, round a saucer-shaped disc. Stamens many. Carpel one only, ripening to a transversely oblong or mallet-shaped leathery fruit, attached by its middle.

Species 18. South Asia, Ceylon, Malaya.

Leaves acute, not acuminate ; petals longer than sepals ; stamens about 20 : racemes short : fruit slightly notched in middle . . . . P. 190. SISPARENSE.

Leaves acuminate ; petals and sepals nearly equal, drupe slightly notched : stamens about 30 . P. 190. GARDNERI.

Pygeum Gardneri *Hook. f.*; *F.B.I.* ii 321, V 12. A large tree with smooth pointed leaves and axillary spikes of small velvety flowers.

Branches lenticelled, glabrous; stipules minute, soon falling. Leaves 4 to 8 by $1\frac{1}{2}$ to 3 inches ovate, acuminate, entire; base rounded or acute; veins conspicuous below: stalks $\frac{1}{2}$ to 1 inch, stout. Spikes 2 to 4 inches, with stout, thickly pubescent rachis: pedicels $\frac{1}{8}$ inch stout. Flowers $\frac{1}{4}$ inch across. Calyx obconic with ten to twelve hairy obtuse lobes alternately larger petals and smaller sepals, deciduous as a whole. Stamens twice as many in two rows, exserted. Ovary glabrous surrounded at the base by hairs: style short. Fruit $\frac{3}{4}$ to $1\frac{1}{4}$ by $\frac{1}{2}$ inch, transversely oblong and obscurely two-lobed, rounded at the ends attached by the middle of one side. **t. 146.** Wight Ic. t. 993.

Pulneys: Kodaikanal. In the station shola and in others. Nilgiris: hill above Pykara 7,500 feet. Flowering after the rains, fruiting in December and June.

Gen. Dist. Western Ghauts and northwards to Mableshwar.

In F.B.I. the stamens are given as twelve and short. *C.F.B.* rightly gives them as more than twenty and well exserted. Both remark on the inequality of the lobes of the calyx; they seem to me alternately large and small.

Some species have glands at the base of the leaves; this one has not.

P. sisparense *Gamble*, at Sispara (*G.F.M.P.*), and possibly occurs at Bangitappal.

PRINSEPIA. F.B.I. 151 VI.

One species only.

Prinsepia utilis *Royle; F.B.I.* ii 323, VI 1. A spiny shrub: branches green, round and smooth. Leaves shortly stalked, 2 by $\frac{1}{2}$ inch, elliptic acute, entire or finely serrate except towards the base, glabrous. Flowers

in the axils of the upper leaves or of bracts, forming racemes along the upper branchlets, on rather stout $\frac{1}{2}$ to 1 inch pedicels, which may have two or three minute scales. Buds top-shaped, purplish brown in the lower half. Sepals $\frac{1}{6}$ inch, concave, round. Petals $\frac{1}{3}$ inch, round with crinkled edge, white. Stamens numerous with yellow anthers, from a conspicuous disc. Ovary superior, one-celled ; ovules two, attached to one side, pendulous : style basal, bent below the large flat stigma. Fruit roughly oblong, rounded at each end, with the persistent style attached near the base. Seed one only, erect with thick cotyledons. **t. 147.**

Nilgiris : on the Coonoor-Kotagiri road at 7,000 feet, flowering June, apparently wild. A native of the Himalayas used sometimes as a hedge plant.

Gen. Dist. Dry rocky hills of temperate Himalayas to Sikkim at 9,000 feet and Khasi hills at 6,000 feet.

RUBUS. F.B.I. 51 VIII.

Bramble.

Prickly rather straggling shrubs with simple lobed or compound leaves, and terminal or axillary corymbs of pink or white flowers of five sepals, five petals, many stamens and on a raised centre (torus) many separate carpels, each of which becomes fleshy, with a small stone inside ; the whole fruit being composed therefore of a number of small drupes (Blackberry, Raspberry).

Species about 100, abundant in the northern hemisphere.

Name from the Celtic RUB = *red.*

Great variations occur in both the leaves and inflorescence of many of these species, and this has led to the genus being divided up not only into sections or sub-genera and species but the latter also again into sub-species and micro-species, which are supposed to come true to seed. The genus has recently been monographed on these lines by Foche. The sub-species

distinguished by Gamble as occurring here are difficult to determine with any degree of confidence. I retain therefore the more comprehensive species of the F.B.I. which are the group species or sub-genera of Foche.

Leaves simple, lobed . . . 1. R. moluccanus, *L* and subspecies.
Leaves of three leaflets . . . . 2. R. ellipticus.
Leaves of five to seven leaflets . . . R. niveus and racemosus.

1. **Rubus moluccanus** *Linn.; F.B.I.* ii 330, VIII 11'; Purple Bramble. Very prickly shrubs, the shoots covered with a dense or fine tomentum. Leaves up to 8 inches by 5 inches, simple, with three to seven lobes, ovate or triangular, deeply cordate at the base, very rugose on the upper side by the impression of the veins, tomentose on the under. Stipules oblong, laciniate or fimbriate. Flowers in terminal panicles. Bracts deeply cut. Sepals tomentose with fimbriate margin. Petals white. Fruit dark purple. Wight Ic. 225.

Everywhere on the downs of Ootacamund and Kodaikanal forming thick clumps, but not seen below our level.

Gen. Dist. Central, eastern and tropical Himalayas, Nepal, Sikkim, Burma, Assam, South Indian hills but not, or only very rarely, on the Bombay Ghauts; Ceylon, Malaya.

This protean species includes the following :—

(*a*) *Bracts broadly ovate or obovate, laciniate at apex.*

Rubus rugosus *var. Thwaitesii.* Leaves orbicular in outline, up to 6 inches diameter, the lobes rounded scarcely lobulate, the sinuses shallow; tomentum thick, fulvous: inflorescence dense. A large strongly growing shrub with large purple black fruits.

Nilgiris at high levels. Doddabetta at 8,000 feet.

Rubus Farholmianus *Gard.* Leaves ovate, up to 9 inches by 7 inches; the lobes acute, the end one long and usually again lobulate; tomentum short, white or pale fulvous; inflorescence loose. A large shrub with white tomentum and red fruits.

Pulneys: 5,000 to 7,000 feet.

(*b*) *Bracts pectinately laciniate with linear segments: leaves deeply cordate, not lobulate, rugose with small areoles.*

Rubus fulvus. Petals nearly as long as the calyx lobes: leaves up to 6 inches diameter, the lower lobes rounded or sub-acute, the end lobe acute; inflorescence large in spreading panicles.

Hills of Coimbatore, 3,000 to 6,000 feet.

2. **Rubus ellipticus** *Smith; F.B.I.* ii 336, VIII 28; Yellow Bramble or Yellow Raspberry. Shrub, young parts covered with white tomentum partially or wholly concealed by red hairs; prickles slender, curved down. Leaves pinnately three-foliate; leaflets 1 to 4 inches, rounded or pointed, obovate or elliptic or nearly circular, irregularly dentate, very variable in regard to the covering of the lower surface, that being nearly glabrous, white-tomentose, or shaggy: midrib with prickles: nerves very straight forking near the margin: terminal leaflet 1 to 4 inches; lateral smaller, sometimes only half as long. Flowers white in dense terminal and axillary racemose panicles: bracts lanceolate. Petals with long stalks, reflexed between the sepals. Sepals ovate, acute or mucronate, white on the outer (under) side, with or without red hairs. Fruit yellow, luscious with the flavour of a Raspberry. Wight Ic. 230.

On the open downs. . Pulneys : near Kodaikanal. Nilgiris : Ootacamund westwards to Naduvattam, and very common on Eastern plateau, Coonoor to Kodanad.

Gen. Dist. Temperate and tropical Himalaya, Khasia, Burma, Western Ghauts but not in Bombay *C.B.F.*, Ceylon, Yunan.

var. Wallichiana *Wight and Arnott ex Foche ;* leaves green underneath ; appears to me to be connected with the type by many gradations.

3. **Rubus niveus** *Thumb.*, in the Fl. N. & P. Ht. as R. lasiocarpus *Sm.*, and 4. **R. racemosus** *Roxburgh.*

For convenience of distinguishing these two very closely allied species, I take them together.

Rambling shrubs with odd-pinnate leaves of seven, five or occasionallly three leaflets. Older branches reddish brown, often with a white powdery bloom, very prickly, as also the leaf-stalks and even the midrib of the end leaflets. Lateral leaflets ovate or obovate, acute or not ; end one broader and more rounded at the base, often lobed ; all sharply and irregularly toothed, and with five to ten pairs of very straight veins running from the midrib right to the margin, near which they may fork : but occasionally, especially when there are only three leaflets, the terminal one has three veins from the base, exactly as if the three end leaflets were fused in one. Flowers in corymbs terminal and axillary : pedicels slender, $\frac{1}{4}$ to $\frac{3}{4}$ inch. Sepals triangular acute or long pointed. Petals red, roundish. Carpels hairy, fruits red. Always in flower.

i. **R. niveus ;** *F.B.I.* ii 339, VIII 35. Branchlets and other parts without glands, but covered with a dense white tomentum, as also the undersides of the leaflets and the inflorescence. Leaves 4 to 7 inches, lateral

leaflets 1 to 2½ inches. Flowers many, ½ inch across. Sepals densely white inside and out, acute but not acuminate. Fruit ½ inch, purple, covered with white bloom.

Pulneys : Kodaikanal downs in thickets, common. Nilgiris : Coonoor.

Gen. Dist. Widely over the mountains of India, Ceylon, Burma, Java.

ii. **R. niveus** *var.* subglaber. Leaves not white underneath, glabrous except on the nerves. Thorns large, recurved from broad bases.

At high elevations [*G.F.M.P.*].

4. **R. racemosus** *Roxburgh* (*hairy form*) ; *F.B.I.* ii 340, VIII 36. Branchlets, leaf-stalks, and inflorescence clothed with glandular hairs and also other short hairs, but not a thick tomentum. Leaves from 4 inches, including the stalk to 8 inches. Leaflets five or three, densely white below ; the lateral 1½ to 3½ inches, acute or obtuse. Flowers few, nearly an inch across on pedicels of ½ to ¾ inch in mostly axillary corymbs or corymbose cymes. Sepals white inside and out, prickly, with fine point (acuminate). Petals as long or longer, ¼ inch across, distinctly stalked. Fruiting stalks decurved. **t. 148.**

Kodaikanal downs. Vembadi shola. Nilgiris : on the downs.

This occurs also near Ootacamund with much white bloom on the branches and corymbs mainly *terminal.* Also, with long dark purple branches covered with white bloom, leafless but bearing short leafy twigs covered with red hairs ; corymbs in the uppermost axils very dense ; fruiting pedicels decurved and the adjacent corymbs forming together dense terminal clusters of fruit. Pykara.

This plant is matched exactly by a sheet of Wight's (*Kew Dist.* 912, at Kew), labelled *Pulney mountains September* 1836 and is probably therefore the plant referred to in the F.B.I. as Wight's glabrous specimen, which " resembled *var.* subglaber of R. lasiocarpus " (R. niveus).

FRAGARIA. F.B.I. 51 X.

Strawberry.

Small herbs with trifoliate leaves and creeping stolons, by which they spread and multiply ; and distinguished in fruit by the fleshy torus on which the dry seed-like achenes are set. Branches, leaves, etc., silky ; stipules large. Flowers on axillary stalks mostly solitary Calyx tube wide, bearing below an epicalyx of five green bracteoles alternating with the sepals ; both persistent. Stamens about twenty. Carpels on a convex centre which in fruit becomes fleshy ; achenes very numerous and small, glabrous.

A very small genus of perhaps half a dozen species, found only in temperate and Alpine climates, all over the northern hemisphere, but also on the mountains of Mexico and Chile.

Named from the Latin FRAGRANS *because of the fragrant fruit.*

Flowers white in tall panicles or solitary ; fruits pale pink. F. nilgerrensis.
Flrs. yellow, solitary ; fruits red ; epicalyx large . . F. indica.

Fragaria indica *Andr. ; F.B.I.* ii 343, X 1. Rootstock stout, runners slender, with long internodes making the plant diffuse ; green parts more or less silky, densely hairy below. Flowers ½ to 1 inch across, on peduncles of 2 to 4 inches ; epicalyx broadly triangular and three-lobed, sometimes much exceeding the sepals, reflexed in fruit, but also smaller and less conspicuous. Petals yellow. Fruit bright red, ¼ to ½ inch diameter spherical, insipid ; achenes obscurely pitted. **t. 149.** Stipules and bracteoles variable in size.

Pulneys : Kodaikanal. Nilgiris : common.

Gen. Dist. Temperate and sub-tropical Himalaya, Sikkim 4,000 to 8,000 feet, Darjeeling, Khasia, Tenasserim.

Fragaria nilgerrensis *Schldl. ; F.B.I.* ii ; 344, X 3 ; White Nilgiri Strawberry. A strong growing plant, with stout rootstock surrounded by the broad bases of the leaf-stalks, with their stipules of ½ to ¾ inch. All green parts clothed with stout hairs. Leaflets regularly and coarsely toothed ; veins numerous, close, running parallel and straight from the midrib nearly to the margin. Peduncle simple or repeatedly forked above, 6 to 8 inches high villous ; bracts ⅓ to ¾ inch deeply bifid. Flowers white ⅜ to ⅝ inch across. Sepals reflexed in fruit. Fruit conical, pale, edible. **t. 150.** Wight Sp. Nilg. t. 61 (F. elatior), Ic. t. 988.

In shady places flowering early in summer. Pulneys : Kodaikanal, etc. Nilgiris : on both halves of the plateau : Ootacamund, Kodanad, Pykara. *Bourne* 1065.

F.B.I. unites with this plant one from the Khasi hills, which however differs slightly in fruit.

POTENTILLA. F.B.I. 51 XI.

Small herbs in habit like the Strawberry, but with hard not juicy fruits (*torus*) and usually with at least the lower leaves of five or more leaflets.

Species about 150 in the cold and temperate regions of the northern hemisphere ; on tropical mountains and in the southern hemisphere only a very few. Great Britian has 9 species—Cinquefoil, Silverweed, etc.

Leaves pinnate ; flowers ½ inch . . . . P. Leschenaultiana.
Leaves digitate ; flowers ¼ inch . . . . . . P. Kleiniana.

Potentilla Leschenaultiana *Ser. ; F.B.I.* ii 350, XI 15. Whole plant softly hairy, much tufted, a few inches high. Root very stout tapering downwards, the top (root-stock) ¾ inch, covered with the remains of the leaf-bases. Lower leaves with their stalks, 6 to 10 inches ;

leaflets three at the end of the stalk, and a pair a little below, and sometimes a second pair, a third down the stalk. Upper leaves three-foliate : leaflets $\frac{3}{4}$ to 3 by $\frac{1}{2}$ to $1\frac{1}{8}$ inches, obovate-oblong with cuneate base, closely and deeply serrate, with broadly triangular sharp or blunt teeth. Stipules large. Corymb branches much forked. Flowers bright yellow, $\frac{1}{2}$ to $\frac{3}{4}$ inch. **t. 151.** Wight Ic. 990. Achenes wrinkled, but not deeply, $\frac{1}{10}$ inch.

In open grass land common.

Very variable in size and hairiness. Glabrous specimens from Kodaikanal are very similar to P. fragarioides *L.* but the teeth are not so sharp.

This name was given (DC. Prod. ii 584) to the Nilgiri plant. The species should perhaps be reduced to *P.* fragarioides *L.* which occurs all over northern Asia and Europe.

Potentilla Kleiniana *W. & A.; F.B.I.* ii 359. A prostrate plant. Leaves digitately five-foliate ; leaflets obovate or oblanceolate. Flowers $\frac{1}{4}$ inch to $\frac{1}{2}$ inch yellow : achenes dark deeply wrinkled, $\frac{1}{20}$ inch.

Nilgiris : near Ootacamund. Kotagiri. Kodanad.

ALCHEMILLA. F.B.I. 51 XIII.

Lady's-mantle.

Small herbs with trailing stems and long-stalked roundish leaves, peculiar in their very regular rounded lobes and the strong palmate nervation and fanwise folding ; and characterized by the small greenish flowers of four sepals, no petals, and one to four inferior carpels enclosed in the calyx tube.

Species about 60. Mostly from the Andes of Central America from Mexico to north Chili. A few in the temperate zone of the northern hemisphere, mountains of India,

Ceylon, Madagascar, South Africa and Java. Absent from northern India, south of Kashmir, Australia and temperate North America.

Some of the species on the Peruvian Andes show marked adaptation to the conditions of mountain life: they grow in tufts with small leaves closely appressed to the stem, as wooly points resembling the Horsetails.

Name from AL-KENNELYEH, *the Arabic name.*

Alchemilla indica *Gard.; F.B.I.* ii 361, XIII 2; Indian Lady's-mantle. Rootstock woody; stem slender $\frac{1}{10}$ inch thick, trailing in grass, covered with soft hairs Leaf-stalk 1 to 2 inches; stipules $\frac{1}{2}$ inch connected into a tube with oblong acute tips. Blades circular and deeply cordate (or kidney-shaped) very evenly five to seven lobed; the lobes rounded finely toothed; glabrous above, nearly so underneath; margin silky; nerves one to each lobe; veins obscure; stalk of inflorescence up to $5\frac{1}{2}$ inches, forked or branched several times with small deeply lobed or three-fid bracts. Flowers $\frac{1}{8}$ to $\frac{1}{6}$ inch across. Sepals eight, villous outside, glabrous inside, outer four sepals smaller; inner four triangular, thin. Stamens four, alternating with these. Wight Ic. t. 229.

In open grass land on the higher downs abundant: much less common elsewhere.

Very similar to the Lady's-mantle of Great Britain.

ROSA. F.B.I. 51 XVI.

Rose.

Very prickly often straggling shrubs with odd-pinnate leaves having large stipules adnate to the leaf-stalk, and showy terminal flowers solitary or in corymbs; distinguished from all others of the family by the egg-shaped calyx tube in which are a number of separate carpels each

with its style protruding through the mouth of the chamber, and which in fruit becomes slightly enlarged and leathery and contains a number of hairy achenes.

Many of the species are highly variable and the number is variously put at from 30 to 300 according to the conception of species held. *Dist.* over the temperate and sub-Alpine regions of the northern hemisphere but rare in America ; not south of Abyssinia, India or Mexico.

Name from the Celtic RHOD = *red.*

Rosa Leschenaultiana *Wight and Arnott ; F.B.I.* ii 368, XVI 9 ; Nilgiri Dog-rose. A large straggler. Leaflets five, glabrous, obovate-oblong-acute or shortly acuminate, sharply and finely serrate, glabrous on both sides: midrib with a few prickles : main stalk glandular and prickly ; stipules adnate for as much as an inch with five spreading points. Flowers white 2 to 3 inches diamater, in terminal cymose corymbs : pedicels slender. Calyx tube contracted below the much larger acuminate sepals. **t. 152.** Wight Ic. t. 38.

On the edges of shola, roadsides, etc. Abundant. Nilgiris : on both plateaus, flowering May.

Gen. Dist. Nilgiri and Pulney hills only.

Rosa indica *Linn. ; F.B.I.* ii 364. A large shrub. Leaves glabrous pinnate. Leaf-stalks with very narrow stipular wings at the base. Flowers pink, rather large on long pedicels.

A cultivated plant, wild or run wild near Pykara and elsewhere on the Nilgiris.

Flowers : March and April.

PHOTINIA. F.B.I. 51 XXI.

Trees with simple evergreen leaves and small flowers of five sepals, five petals, many stamens, and a few (one to five) carpels, entirely enclosed in calyx tube which ripens

into a small berry with one to five thin-walled chambers containing the seeds.

Species under ten in tropical and sub-tropical regions of Asia.

Name from PHOTEINOS = *shining, because some species have shiny leaves.*

Leaves serrate or crenate . . . . P. Lindleyana.
Leaves quite entire . . . . P. Notoniana.

Photinia Lindleyana *Wight and Arnott ; Herb. Wight Prop.* 1012 and 1013 *! ; F.B.I.* ii 380, XXI 1. A medium sized tree with crooked branches. Leaf-stalks 1½ inches, red : blade ovate-elliptic or lanceolate, rounded or occasionally unequal at the base, acute, mucronate, serrate-crenate or sometimes almost entire sometimes very hard and coriaceous, dark-green above, lighter underneath ; nerves slender about sixteen pairs, joined by close reticulation. Panicle irregular, 1½ to 3 inches high. Fruit ⅓ inch bright pinkish scarlet. **t. 153.** Wight Ic. t. 228.

Nilgiris : Pykara, Coonoor, Biccapatti. Not collected on Pulneys nor at the highest levels.

In outline the tree is somewhat like P. Notoniana but flatter, without tall pyramidal masses of foliage.

Var. tomentosa *Gamble.* Petioles under surface of young leaves and inflorescence softly tawny-tomentose : leaves almost entire, serrate towards the apex up to 7½ by 4 inches.

Nilgiris : chiefly in sholas towards Sispara, at and above 7,000 feet [*G.F. M.P.*].

Photinia Notoniana *Wight and Arnott ; Herb. Wight Prop.* 1014 *! ; F.B.I.* ii 380, XXI 2. In the open a small, or in woods, a large tree with straight or crooked trunk and spreading branches. Bark rough and dark, and on the

young branches smooth but for the numerous lenticels : branchlets angular green or red. Leaf-stalks $\frac{3}{4}$ to $1\frac{1}{2}$ inches, glabrous as is the whole plant except the inflorescence. Blades quite entire, ovate, oblong-obovate or oblanceolate, abruptly acuminate : midrib stout, nerves slender about $\frac{1}{4}$ inch apart, joined by a close net-work of veins. Panicles terminal, rounded, excessively branched ; the branches greenish white pubescent, becoming stout in fruit. Flowers sessile, sepals minute, rounded, white or tinged with pink. Petals $\frac{1}{16}$ inch, rounded, white. Stamens about four times as many, in four whorls : filaments white ; those of the two outer whorls spreading as long as the petals, those of the inner shorter and erect. Ovary two-celled, the crown hemispheric, reddish pubescent. Fruit a round purple berry $\frac{1}{5}$ inch diameter, quite smooth with a small five-lobed depression ; flesh very acid. Seeds brown $\frac{1}{8}$ by $\frac{1}{16}$ inch, elliptic, with short blunt point at the upper end, bent to one side. **t. 154.** Wight Ic. t. 991, Ill. t. 86.

The habit of the young shoots which grow often to 4 or 5 feet above the rest remind one of the Apple and Pear, near relatives of this genus. In September the trees often show tall irregular masses of erect bright purplish red leaves, as if on stumps denuded of their smaller branches. The fruit reminds one of the Rowan or Mountain Ash of England.

On the outskirts of sholas on the Nilgiri and Pulney downs 6,500 feet and above. Flowers September in profusion of white blossom.

COTONEASTER. F.B.I. 51 XXV.

Shrubs or small trees with entire leathery leaves, often downy on the backs ; and axillary or terminal cymes of small flowers, with five sepals on a top-shaped calyx tube, five petals, about twenty stamens, an ovary of two to five cells, and a small fruit with two to five hard one-seeded stones.

Species 20 to 30, difficult to distinguish, scattered over Asia, Europe and North America. One or two are commonly cultivated in English gardens for the brightly coloured fruits which remain on through the early winter.

Cotoneaster buxifolia *Wall. F.B.I.;* iii 387, XXV 11. A small shrub often only $1\frac{1}{2}$ feet high with thick woody branches. Leaves $\frac{1}{4}$ to $\frac{1}{2}$ inch, elliptic entire, acute at both ends, one-nerved. White tomentose underneath. Flowers $\frac{1}{4}$ inch in small clusters. Fruit globular, scarlet. Wood hard and tough. **t. 155.**

Nilgiris: in the lower and dryer parts of the plateau, abundant in the Kaity valley and near the old Boer camp; Kodanad, also in Ootacamund, Pulneys: Poombari but not seen at high levels.

Gen. Dist. Doubtfully on the Himalayas.

C. microphylla *Wall.*, a species of Kashmir which is sometimes grown in gardens, is distinguished by the dull surface and the flowers solitary.

ERIOBOTRYA. F.B.I. 51 XIX.

Trees with simple, very coriaceous leaves, and white flowers, in dense narrow pyramidal panicles. Ovary inferior, two tc five-celled. Fruit a berry with two or three seeds.

Species few, in sub-tropical Asia.

Eriobotrya japonica *Lindl.; F.B.I.* i 372, XIX 19; Loquat. A fair-sized tree. Leaves, up to 12 inches by 3 inches, coarsely toothed, very dark-green, rugose and shining, above on the upper and white tomentose on the lower side. Calyx and short pedicels golden brown tomentose. Petals white $\frac{1}{3}$ inch. Fruit like a small oval guava, yellow, smooth, stone very large.

Nilgiris: Planted and common in and about Coonoor and elsewhere on the plateau at 5,000 to 6,000 feet.

Has run wild on the Shevaroys where it was first planted by the Rev. James Lechler in the eighteen forties.

PYRUS. F.B.I. XX.

Apple, Pear, etc. Ovary inferior. Seeds enclosed in leathery endocarp surrounded by the fleshy mesocarp. There are no wild species of this genus.

Pyrus communis *Linn.;* Pear. Leaves broadly ovate, acuminate, crenate. Flowers erect, white, in very short racemes.

Commonly cultivated on the Nilgiri, Pulney and Shevaroy hills.

Pyrus malus, *Linn* Apple. Leaves ovate, crenate; flowers pink, in close bunches, and a more rounded fruit.

SAXIFRAGACEÆ.

A large family not easy of definition but typically with perfectly regular flowers of five sepals, five petals, five or ten stamens, and semi-inferior ovary of two or three carpels.

Well-known wild or garden plants are Saxifrage (*Ger.* Steinbrech), London-Pride, Grass of Parnassus, Hydrangea, Deutzia, Philadelphus ("Syringa") and Currant. Species 500 or 600 all over the world.

PARNASSIA. F.B.I. VI.

Grass of Parnassus.

Marsh plants with perennial rootstock. Leaves all radical, heart-shaped, entire, glabrous, long stalked. Flowers solitary on slender much longer stalks with a bract about half way up; white or very pale yellow. Sepals, petals, stamens and staminodes five, in alternating whorls. Ovary one-celled, with three or four nearly sessile stigmas, and, inside, alternating with the stigmas, as many parietal placentas to which are attached

the numerous horizontal ovules. Seeds with thick embryo and thin endosperm. Capsule semi-superior, small, globose, one-celled, opening by three or four valves.

Species about 12, over the northern hemisphere extending south to these hills.

Named from PARNASSOS, *because of the beauty of the plant.*

The species differ very little in general appearance, though slightly in regard to size, which is always an uncertain character. The main differences lie in the shape of the staminodes, whether fimbriate, three-lobed, or club-shaped, and of the petals, whether entire or cut. The staminodes end in glistering drops of honey, or in some merely appear to do so, and thus attract flies by whom cross-pollination is carried out.

Petals fimbriate, white or pale yellow, $\frac{1}{2}$ inch ; lobes of staminodes five, cylindrical . . . . P. Wightiana.
Petals entire or nearly so, white $\frac{1}{4}$ inch ; lobes of staminodes three, obscure and rounded . . . . . P. mysorensis.

Parnassia wightiana *Wall. ; F.B.I.* ii 402, VI 3 ; Grass of Parnassus of Ootacamund. Leaf-stalks 2 to 4 inches, blades $\frac{3}{4}$ to 1 inch broad, deeply cordate, with five basal veins, the three inner curving forward to meet at the apex. Flowering stems 6 to 8 inches, or more, with a bract half-way up nearly as large as the leaves, and similar to them, clasping the stem. Sepals $\frac{1}{4}$ inch. Petals $\frac{1}{3}$ to $\frac{1}{2}$ inch, oblong obovate, fringed in the lower and narrower part with slender hair-like fimbriæ, white or pale yellow. Staminodes as long as the stamens ending above in five oblong processes with globular glandular heads. Stigma pink, three-lobed. Capsule three-angled or rounded, obcordate ; seeds all near its base, ellipsoid with wrinkled coat. t. **156.**

The anthers at first stand above the stigmas. Later they are reflexed down between the petals and lie each just above a sepal. There they persist after the petals have fallen and until the fruit is nearly ripe.

On the Ootacamund downs in swamps, common. Flowers after the beginning of the rains. Not at Kodaikanal.

Gen. Dist. On the southern and eastern Himalayas, Khasia, etc., China and Yunan. Not northwards on these ghauts, nor on the Himalayas at Simla.

Though placed in a different section of the genus because the staminodes are less divided at the top, in general appearance this is remarkably like the European species, *P. palustris*, *Fr.* Parnassie des marais, *Ger.* Herzbluemchen.

Parnassia mysorensis *Heyne ; Herb. Rottler., Wall. Cat.* 3754 *! ; F.B.I.* VI 4, in part ; Grass of Parnassus of Kodaikanal. Leaf-stalks, $\frac{1}{2}$ to 2 inches : blades cordate, nearly circular, thick, with five or seven veins curving forwards to the apex but not conspicuous. Flower stems 5 to 8 inches : bract about half-way, like the leaves or more often smaller. Sepals $\frac{1}{6}$ inch. Petals obovate-oblong, the narrow basal part entire or nearly so. Staminodes obscurely three-lobed or club-shaped, much shorter than the stamens. Capsule obcordate, three-lobed ; seeds small. t. **157**. Wight Ill. t. 21.

Pulneys : in swamps common. Nilgiris : on the downs to Avalanche and Naduvattam.

* *Nilgiri Form.* Petals slightly fringed ; staminodes with 3 distinct lobes. A smaller plant growing on wet rocks. t. 157.

Gen. Dist. Western Ghauts, Mysore, Bababoodons.

CRASSULACEÆ.

A cosmopolitan family, closely allied to the last, and differing from it chiefly in the carpels being of the same number as the petals or sepals, so that the flowers are

perfectly symmetrical. The fruit too consists of follicles (the carpels being separate), which open down the inner faces and have usually many seeds. In some genera the petals are united into a tube, so that the distinction of polypetally and sympetally, so important in other cases, here breaks down. A very large number of the family have smooth succulent leaves, and are able to grow in places where water is at times scarce ; as instance the Stone-crop or Wall-pepper (*Ger.* Mauerpfeffer, *Fr.* Orpin), Pennywort and House leek (*Ger.* Hauslauch, *Fr.* Joubarbe) and the common BRYOPHYLLUM of the Indian plains, whose leaves will remain alive for weeks after being detached from the plant, and throw out shoots and roots.

Species 400, scattered all over the world, except Polynesia, rare in Australia and South and North America.

KEY TO THE GENERA.

Sepals quite free . . . . KALANCHOE.
Sepals connate into a tubular calyx . . BRYOPHYLLUM.

KALANCHOE. F.B.I. 53 IV.

Stout perennial herbs with lower leaves at least opposite ; four-partite calyx ; flask-shaped tubular corolla with four spreading lobes, persistent round the fruit ; eight stamens ; and oblong seeds with eight to fifteen longitudinal ribs.

Species 25 chiefly in tropical and South Africa, some in Asia, one in Brazil.

KALANCHOE *is the Chinese name of one species.*

Sepals narrow, inflorescence glandular . . . K. floribunda.
Sepals broad, inflorescence not glandular . . K. grandiflora.

Kalanchœ grandiflora *Wight and Arnott ; F.B.I.* ii 415, IV 4. A thick-stemmed, thick-leafed shrub with masses of bright yellow four-petalled flowers.

Stem and lower branches an inch or more thick, but tapering upwards, round and smooth except for the numerous flat leaf-scars, which are in opposite pairs and may be $\frac{3}{4}$ inch wide and $\frac{1}{4}$ inch deep and are joined round the axis by a smooth ridge, the younger scars showing a row of three to six bundle-scars. Leaves opposite, obovate-obtuse, almost flat at the end, crenulate, glabrous, glaucous and thick. Flowering stem terminal, leafless, 2 or 3 feet high, dividing above repeatedly into three yellowish-green branches, the middle one of which always ends in a flower (very regular three-chotomous cymose panicle). Bracts $\frac{1}{20}$ to $\frac{1}{4}$ inch scarious, obovate or elliptic acute : pedicels $\frac{1}{2}$ to $\frac{3}{4}$ inch expanded under the flower. Calyx tube $\frac{1}{10}$ inch sepals $\frac{1}{4}$ by $\frac{1}{6}$ inch, oblong-acute. Corolla tube, four-angled, $\frac{1}{2}$ inch, contracted at the top and then spreading in four yellow obovate lobes $\frac{1}{2}$ by $\frac{1}{4}$ inch. Stamens eight, four at the mouth of the tube between the lobes and very short, four longer, about $\frac{1}{16}$ inch, on the base of the lobes : anthers small. Carpels distinct very nearly to the base, $\frac{1}{6}$ by $\frac{3}{8}$ inch tapering above to the $\frac{1}{6}$ inch style : a slender gland or staminode $\frac{1}{6}$ inch long opposite each. Fruit sheathed by the dried, stretched, corolla tube. Seeds very numerous, attached in pairs on rounded bases to the placentas. **t. 158.** Wight Ill. t. 111. Our figure gives but a poor idea of this handsome plant.

On the higher slopes on rocky ground or poor soil. Near Ootacamund it flowers December to February in masses on the Dodabetta-Snowdon ridge, colouring it yellow. Occasional

flowers may be found up to July. Pulneys : on downs towards Fort Hamilton, flowering December. Kodaikanal ; flower February and March.

Kalanchœ floribunda *W. & A ; F.B.I.* ii. 414, IV. 3. Similar in habit to the last species, but upper parts of stem and inflorescence covered by glandular hairs, and sepals narrow. Flowers smaller, yellow ; in fruit the tube portion shiny white.

Shevaroys : on plateau flowering Christmas, also Deccan, etc.

K. laciniata, *D.C.* ; *F.B.I.* ii 415, IV. 6, with leaves pinnate (or deeply pinnately cut) and leaflets (or segments) also deeply cut ; and large terminal corymbs of pale yellow flowers occurs on the top of the hill of Horsleykonda.

K. Bhidei. *T. Cooke* ; similar in habit to K. floribunda, but not glandular, and with pink, or reddish flowers, occurs on Horsleykonda.

BRYOPHYLLUM.

Shrubby plants with opposite, simple or whorled fleshy leaves. Flowers in terminal panicles. Calyx and corolla both tubular, four-lobed. Stamens 8, attached to the base of the (monopetalous) corolla. Carpels 4, quite free of each other, each with a slender straight style without stigmatic head. Fruit of many follicles.

Species mostly Mexican, introduced and occasionally found wild.

Bryophyllum pinnatum *Kurz* Stem four-angled. Leaflets 3 to 7, ovate to obovate, 2 to 3 inches long by 1½ to 2 inches, crenate and with bristles in the notches. Panicle 3 to 4 feet high, the branches opposite and flowers

well separated. Calyx $1\frac{1}{4}$ inches long, pale yellowish green with reddish base. Corolla $\frac{3}{4}$ inch longer, reddish-brown towards the tips of the lobes. Stamens of different lengths shorter or longer than the styles.

A native of Mexico. Nilgiris: Coonoor, Kotagiri, etc.

Bryophyllum calycinum *Salisb.* very similar to the above and possibly the same species, but with usually simple leaves 4 to 5 inches long is frequent in Madras and the drier parts of Mysore. The leaves readily sprout at the notches if hung up separately, or if immersed in water.

DROSERACEÆ.

A small family of 110 species chiefly remarkable for their folding or sticky leaves by which small insects are caught and digested.

DROSERA. F.B.I. 54 I.

Sundew.

Small herbs with perennial rootstock or tuber. All the leaves as a rosette on the ground or some on a short stem, covered with long-stalked sticky glands. Flowers in raceme-like scorpioid cymes. Calyx tube short; sepals four or five suberect, imbricate. Petals as many persistent. Stamens as many. Ovary free of the calyx, one-celled with two to five styles. Fruit a capsule. Seeds many on parietal placentas.

Species about 90 distributed all over the world except the Pacific islands.

The glands are of two kinds, long-stalked glands which secrete a sticky solution by which flies and other small winged insects are caught, and which then by a bending of the stalk bring the insect close against

the leaf, and short ones almost sessile on the surface of the leaf. See Darwin's *Insectivorous plants.*

No stem. Leaves all on the ground forming a red rosette. D. burmanni.

Stem leafy, 3 inches, with peltate leaves . . . D. peltata.

Drosera Burmanni *Vahl.*; *F.B.I.* ii 424, I 1; common Sundew. Flowering stems 3 to 6 inches, bare for the lower four-fifths. Leaves in a rosette 1 inch across, where growing in full sunlight very red and glistening, fringed with long-stalked glands, cuneate or spathulate. Flowering stem 3 to 6 inches: flowers in a close one-side raceme-like scorpioid cyme, white. Sepals entire, red, covered with minute papillæ. Ovary with five styles. **t. 159.** Wight Ill. t. 20 ex. styles; Ic. t. 944.

In damp places common. Everywhere from near Madras to the top of these hills.

Gen. Dist. All over India.

Drosera peltata *Smith*; *var.* lunata; *F.B.I.* ii 424, I 3; Moon-leaf Sundew. A delicate herb distinguished among all our plants by the roundish crescent-shaped leaves, $\frac{1}{6}$ inch across, fringed by long-stalked glands, and attached by stalks of $\frac{1}{2}$ inch to the slender almost unbranched stems. Stem 3 to 12 inches, very slender often red. Basal leaves of the young plant soon disappearing so that only stem leaves remain. Stalk of stem leaves $\frac{1}{2}$ inch, blade $\frac{1}{6}$ to $\frac{1}{4}$ inch, with fringe of long-stalked glands, often red, very sticky. Sepals not fimbriate. Styles three, bifid. **t. 160.** Wight Ill. t. 20.

On the open downs everywhere, more especially in damp spots.

Distributed throughout India.

HALORAGIACEÆ

Weak water or land plants with opposite or whorled leaves often toothed at the apex and small flowers with the parts in fours or by reduction fewer, and an inferior ovary containing typically four seeds.

Species about 80, all over the world. In Europe Marestail, *Ger.* Tannenweudel ; Water milfoil, *Ger.* Tausendblatt, *Fr.* Mille feuille d'eau ; and Hornwort, *Fr.* Cornifle.

Name from HALS = *the sea, and* RHAX = *a berry.*

SERPICULA. F.B.I. 56 II.

Small marsh herbs, usually reddish with opposite leaves and small unisexual inconspicuous flowers. Stem single or branched, very variable in length and robustness, from 2 to 14 inches, glabrous or hairy. Leaves from $\frac{1}{4}$ by $\frac{1}{16}$ inch, to $\frac{5}{8}$ by $\frac{1}{4}$ inch, oblanceolate, cuneate at the base, entire or with two or four spreading acute teeth and a middle ovate one or crenate in upper half. Ovary flowers shortly stalked, $\frac{1}{30}$ by $\frac{1}{40}$ inch elliptic, the calyx tube surmounted by four small lobes but no petals. Male flowers on hair-like pedicels of $\frac{1}{3}$ to $\frac{3}{4}$ inch in the same axils as the female. Female flowers sessile or nearly so with 4 stray stigma producing from calyx. Sepals $\frac{1}{50}$ inch. Petals $\frac{1}{10}$ inch, boat-shaped, soon falling. Anthers as long. Nut $\frac{1}{30}$ inch with or without about eight ridges or ribs in the lower half. Wight Ic. t. 1001.

Name from the Latin SERPO = *I creep.*

Two species have been distinguished.

Serpicula brevipes *W. & A.* Glabrous plants : leaves entire or toothed : male pedicels under $\frac{1}{2}$ inch, petals acute ; fruit glabrous, ribbed and with warts. **t. 161.**

Western Ghauts. Nilgiris : Pykara to Kodanad ; and Pulneys 6,000 to 7,000 feet in wet places.

Serpicula hirsuta *W. & A.* Hairy plants, much branched : leaves obovate 3 to 5 toothed : male pedicel longer than ½ inch : petals obtuse : fruit hairy, not ribbed. Usually a shorter plant than the last.

Nilgiris : on banks ; common on slope of Church Hill, Ootacamund, flower September.

These two species may perhaps be regarded as wet and dry land forms of the same species and were included in my F. N. F. Ht. as in the F.B.I. under the name Serpicula indica *Thwaites.* I find characters of the one also in the other, e.g., a glabrous plant with long filliform male pedicels and obtuse petals, the fruits ribbed and warty.

MYRIOPHYLLUM. F.B.I. 56 IV.

Herbs in water or on mud, with narrow whorled or opposite leaves and very small unisexual flowers at the leaf axils. Ovary inferior, four-celled ; ovules solitary, pendulous. Fruit separating into 4 or 2 cocci.

Species about 20, in all parts of the world.

Myriophyllum intermedium *DC.* ; *F.B.I.* ii 433, IV 5. Leaves 2 or 4 at a node, linear, distantly serrate. Calyx minute. Male petals 4. Stamens 4. Anthers sub-sessile, nearly as long as the petals. Fruit covered with short spines. **t. 162.** Wt. Ic. t. 1061.

Nilgiris on the plateau, Ootacamund, Kotagiri, etc., in wet places.

CALLITRICHE. F B.I. 56 V.

Aquatic glabrous herbs, with opposite narrow leaves and minute unisexual flowers a male and female in the same axil. Bracteoles 2, white, caducous, but no sepals

or petals. Male with 1 stamen only. Female with 2 styles and an inferior four-celled ovary ; ovules pendulous.

Species few, all over the world.

Callitriche stagnalis ; *Scop.* *F.B.I.* ii 434, V 1. A small weak herb, rooting at the nodes. Leaves oblanceolate or spathulate, ½ inch. Wight Ic. 1917.

Nilgiris and Pulney Hills, in ponds, 7,000 to 8,000 feet [*G.F.M.P.*].

COMBRETACEÆ.

A tropical family of trees, shrubs, and climbers, with alternate or sub-opposite simple leaves, not gland-dotted ; and spikes or racemes of flowers, in which the stamens are definite in number, the ovary inferior and of one cell only, and the fruit fleshy and angular or dry and winged.

Quisqualis indica *Linn.*, the Rangoon creeper, so commonly grown in gardens, is perhaps the one most generally known.

TERMINALIA. F.B.I. LVIII 1.

Trees with alternate or nearly opposite, often whorled, simple leaves ; and terminal, usually simple, spikes of small flowers, with 5 small sepals, no petals, 10 stamens, and an inferior ovary of one cell only, which ripens to an ovoid, angular or winged one-seeded fruit.

Species about 100 in the tropics of the Old World.

Terminalia Chebula *Retz* ; *F.B.I.* ii 446, I 5 in part. Leaves ovate or broadly elliptic, usually rounded at base and blunt or apiculate at apex, slightly pubescent below ; veins fairly straight, 7 to 8 on each side. Fruits one or two on peduncles of 3 to 5 inches, about 1 inch by ¾ inch softly hairy when young, at length glabrous shiny, obovoid and pointed at each end.

Shevaroys : on Green Hills.

Gen. Dist. In dry deciduous forests of Northern Circars and the Deccan.

MYRTACEÆ.

The chief characteristics of this family are the opposite often gland-dotted leaves, inferior ovary, roundish sometimes quickly falling petals, and numerous long stamens curled inwards in bud. Most are trees or shrubs, herbs being rare, and can be recognized even when the translucent glands are not visible by the leaves which have as a rule a distinct scent, and the lateral veins running into one which is close inside the margin. The fruit may be dry or fleshy, and has usually many small seeds. In many the beauty or attractiveness of the flower is due to the stamens.

Species about 2,000 in the warmest parts of the world.

KEY TO THE GENERA.

a { Leaves with 3 to 5 veins from the base, tomentose: fruit fleshy; flowers pink (Hill Guava) . Rhodomyrtus.
Leaves penni-veined or narrow . . . . *b*

b { Lateral veins numerous and slender; fruit a drupe. SYZYGIUM.
Lateral veins inconspicuous; on mature plants leaves alternate: fruit dry . . . . EUCALYPTUS.
Similar to Eucalyptus but fruits in globular heads. SYNCARPIA.
Leaves $\frac{1}{8}$ inch wide only: flowers $\frac{1}{4}$ inch . . BÆCKEA.

BÆCKEA. F.B.I. 59 I.

Leaves narrow and small. Flowers small. Stamens five or ten only. Ovary two to three celled; ovules many on peltate placentas.

Species 60, mostly Australian.

Bæckea virgata *Andrs.*; I 2. Loosely branched shrub with slender twigs. Leaves $\frac{5}{8}$ by $\frac{1}{8}$ inch, linear-lanceolate to narrow-oblong, acute, flat, one-nerved, with numerous pellucid glands, raised on the lower side when dry. Flowers in the upper axils, umbelled by pedicels of 1 inch on peduncles of $\frac{1}{2}$ inch. Calyx hemispheric, $\frac{1}{8}$ inch lobes small and round. Petals round, stamens five: filaments short. Ovary inferior, three-celled: ovules round the edges of peltate placentas. Capsule flat-topped. **t. 163.**

An introduction from Australia, native of New Zealand and from Victoria northwards to Queensland.

The Australian "May" or "Ti-tree."

EUCALYPTUS. 59 II.*

Australian Gum.

Trees with the leaves on the young plants, and on those which spring up from a stump, opposite, sessile horizontal; but on the upper and newer branches alternate, petioled and drooping. Flowers three or more, on axillary peduncles. Calyx top-shaped, scarcely toothed. Petals five, united into a hemispherical cap which soon falls being pushed off by the very numerous, long, slender, many-seriate stamens, with small versatile anthers. Ovary immersed in the calyx tube, three or four celled, with slender style and small stigma: ovules many. Fruit, a hard conical capsule, opening by valves at the top. Seeds small, linear-cuneate: embryo straight, cotyledons longer than the radicle.

Species 150, almost all Australian, but introduced now in many parts of the world.

The change in the position and shape of the leaves appears to be an adaptation to a dry climate, for vertically hanging leaves do not get so much sun in the middle of the day, its hottest time, as the horizontal ones

proper to this family would. The leaf-stalk, which is then formed, not only is necessary if the leaves are to hang free of the branch, but enables the blades to give to the wind and not suffer as they would if attached stiffly like the young leaves. The stripping of the bark is unusual, and it seems to have at any rate this advantage that parasitic Loranthuses do not get a foothold as they do on the Melanoxylon, Rhododendron, and other trees.

Many species are planted of which the chief are—

Eucalyptus Globubus *Labill* the "Blue-gum." **t.** 164. A Native of Victoria and S. Tasmanian. Its great usefulness lies in the fact that it can be "coppiced" i.e., if cut down near the ground it will send up shoots, which in a few years become trees. Oil is extracted from the young leaves, and for this reason all side branches are sometimes lopped off, so that the single stem is covered for many feet with a dense growth of small branches. The Nilgiri plantations date from 1863.

Eucalyptus citriodora *Hook.*, easily recognized by the drooping habit of its branches, slender leaves and its distinct scent is planted also, e.g., at Shambaganur on the Pulneys, but much less commonly.

Eucalyptus ficifolia, *F. M. V.* A much smaller tree with conspicuous crimson or scarlet flowers finely pointed leaves, and egg-shaped pod.

Many other species will be found named in and round Sims Park, Coonoor.

SYNCARPIA. 59 II.*

Turpentine tree.

Trees with the flowers coalescing in globular heads, the inferior ovaries joined in fruit into an irregular mass with hardly more than the round crater-like mouths of each flower showing.

Species 2 or 3 only, Australian.

Named from SYN = with, *and* CARPON = fruit *in allusion to this.*

Syncarpia glomulifera *Sm.* (S. laurifolia *Ten*). A small tree, recognized at once by the fruit, in which four to seven dry hard capsules coalesce into a mass about $\frac{3}{4}$ inch wide, each opening by small valves at the top—is planted occasionally. **t. 165.**

RHODOMYRTUS. F.B.I. 59 VI.

A small genus chiefly remarkable for the tomentose young parts, three-nerved leaves, and ovary divided horizontally (as well as vertically) into one-seeded chambers. Trees or shrubs. Calyx tube turbinate. Petals four to five. Stamens many, in several series : filaments free slender. Fruit a drupe-like berry of one-seeded cells or pyrenes in two to six superimposed series.

Species 5 or 6, nearly all inhabitants of east Australia ; our species widely distributed.

Rhodomyrtus tomentosa *Wight ; F.B.I.* ii 469, VI 1 ; Hill Guava. A round topped bush. Branches downy and compressed towards the tips. Foliage very grey-green, the youngest leaves almost white. Lower leaves often in threes, upper opposite, subsessile : blades elliptic or obovate, 2 by $1\frac{1}{2}$ inches (less or more), with three or five main veins. Flowers pink in small cymose axillary corymbs. Peduncles 2 inches, pedicels $\frac{1}{3}$ inch. Petals $\frac{1}{4}$ to $\frac{1}{2}$ inch, downy on the backs. Not falling soon. Stamens deeper pink. Fruit globular, size of a cherry yellowish crowned by the calyx teeth : seeds compressed. **t. 166.** Wight Ill. t. 971 *f.* 3 ; Sp. Nilg. t. 71.

Common on dry slopes. Nilgiris : on the Eastern plateau, abundant, from the slopes of Snowdon to Kotagiri and Kodanad. Pulneys : on the open downs not common, but abundant lower, near Poombari.

Gen. Dist. Mountains of South India, Ceylon, Malacca, Singapore.

SYZYGIUM. F.B.I. 59 VIII.

One of the three sub-genera, considered now distinct genera, Jambosa Syzygium and Eu-eugenia into which the old genus EUGENIA is divided.

Large trees or shrubs, with opposite, simple and entire slightly scented leaves. Flowers in terminal cymose panicles, with short pedicels, small. Calyx tube egg-shaped, the ovary quite immersed in it : sepals four or five short. Petals as many, round without any stalk ; sometimes connected together and falling off as a whole. Stamens many, in several series : filaments slender, curled down in bud : anthers versatile, small. Fruit a globular or oblong berry, with two seeds.

Species in this sub-genus about 100, most of them belonging to India and Malaya. The F.B.I. gives 76 for India alone.

Several species are cultivated for their fruits, buds, etc., as Clove, Rose Apple, Malabar Plum, Jambalam ; *Fr.* Jambosier ; *Ger.* Kirschmyrthe.

KEY TO THE SPECIES.

a { Panicles terminal . . . . *b*
Panicles in axils of fallen leaves . . . S. Jambalanum.

b { Leaves $2\frac{1}{2}$ by $1\frac{1}{4}$ inches elliptic acuminate drooping. . . . . S. Arnottianum.
Leaves 4 by 2 inches elliptic obtuse, thick, stiff ; twigs thick, four-angled . . . . S. montanum.
Leaves 1 by $\frac{3}{4}$ inch nearly round, close set, stiff . . . E. calophyllifolium.

Syzygium Arnottianum *Walp.* (Eugenia Arnottiana *Wight, Herb. Prop. !*) ; *F.B.I.* ii 483, VIII 41. Distinguished among our species by its spreading habit, its bunches of red flower-buds or berries, and its limply drooping leaves.

Bark grey, smooth, usually well covered with lichens; main branches spreading, crooked and bent. Leaves opposite or nearly so, when freshly opened pinkish-red and erect, but soon drooping; elliptic narrowed at the base to the $\frac{1}{2}$ inch stalk, and acute or acuminate at the apex; with strong midrib and very close lateral nerves meeting in a marginal one very close to the edge; finely dotted both sides, hard and shining, coriaceous. Flowers nearly sessile, in terminal umbel-like cymes, with square branches 1 inch long: bracts soon falling. Calyx broad above, lobes four. Petals distinct, cream-coloured, in bud crimson. Stamens white, spreading stiffly. Berry $\frac{1}{3}$ inch by $\frac{1}{2}$ inch rather long-egg or urn-shaped, crowned by the sepals, purple when ripe, juicy but quite inedible. **t. 167.** Wight Ic. t. 999.

Nilgiri, Pulney and Shevaroy hills; everywhere on the plateaus, one of the very commonest trees by the wayside or in sholas where it overtops most others. Pulneys: down to 5,500 feet. Not on the Bombay Ghauts, nor elsewhere in India. Flowers in the winter months to April, in fruit during the summer.

In the shola this tree has usually a reddish look at the top from either the numerous bunches of berries or the flush of young leaves; and the leaves always droop.

What is apparently a variety of this species but distinguished by its leaves shorter and not acuminate, the veins thicker and more veticulate, the petioles and blades stiffer, so that they stand erect, more as in S. calophyllifolium occurs in a valley near and immediately north of Mukarte Peak.

Syzygium montanum *Gamble*, formerly Eugenia montana *Wight F.B.I.* ii 488, VIII 57. A large tree, distinguished from all other of our species by the wings on the four edges of the youngest branches, especially in the flowering part; the branchlets also very ($\frac{1}{6}$ inch)

thick, and the leaves larger than in other of our species, with stronger, not closely set veins. The foliage is distinctly lumpy.

One of the very largest of shola and wayside trees, the main trunk short, but thick : the branches spreading widely, very bent and crooked, with dull red-brown bark cracked like that of the Scotch Pine. Branchlets, smooth green, four-angled and winged. Leaves opposite or occasionally alternate, obovate or oblong-obovate, up to 6 by 3¼ inches, on short stout stalks of ¼ to ½ inch ; dark dull green, dotted below : midrib channelled on the upper side ; veins about $\frac{1}{5}$ inch apart (the alternate stronger), prominent on the underside. Flowers in dense cymose corymbs, on stoutstalks in the axils of the uppermost leaves and leaflike bracts ½ to ¾ inch long, forming dense panicles : cyme branches all very stout, angled. Sepals four obtuse. Petals four united and falling as one piece. Fruit purple, crowned by the sepals. t. 168. Wight Ic. t. 1060. Wood greyish brown moderately hard. *Badaga.* Poonagay.

Nilgiris : near Ootacamund and below to Pykara, and Coonoor. Is not common on the further down south-westwards and not seen on Eastern plateau. Young leaves in December, flowers soon after.

Syzygium calophyllifolium *Walp.* ; formerly Eugenia calophyllifolia *Wight Herb. Prop. ! ; F.B.I.* ii 494, VIII 86. Distinguished among our species by its almost round, closely set and stiffly-erect, leaves.

A tree flowering when only 10 feet high, but becoming eventually one of the largest, 40 to 60 feet and overtopping all others in the shola. Branches with brown bark when young square ; often arising three or four together and almost umbelled. Leaf-stalks $\frac{1}{6}$ inch, blade broadly

elliptic or obovate, obtuse or retuse at apex, acute at the base, 1 by $\frac{3}{4}$ inch, or a little larger ; with numerous veins more or less parallel but also reticulate below, ending in a hardly distinct marginal vein ; without pellucid dots ; very hard and firm. Flowers in terminal cymose corymbs : peduncles $\frac{1}{2}$ to $\frac{3}{4}$ inch, green, rough but glabrous. Calyx conical, $\frac{1}{12}$ inch, with four short erect sepals. Petals round united and falling as one hemispherical piece, white. Stamens 16 inches curled up in bud, white. Style $\frac{1}{4}$ inch. Fruit erect, dark purple, $\frac{1}{2}$ to $\frac{3}{4}$ inch by $\frac{3}{8}$ to $\frac{1}{2}$ inch, juicy and edible. Seed one, cotyledons very thick. **t. 169.** Wight Ic. t. 1000.

Nilgiris : Western plateau from Snowdon to Avalanche and beyond, and to Pykaras abundant ; flowering in early January, the whole tree at once, for a day or two only. Not on the Pulneys nor anywhere else but Ceylon, on Adam's Peak.

As a small tree remarkable for its dense mass of rather upright branches and close set erect leaves, as stiff as the Box, but in the shola on Snowdon and Ganapakkam near Pykara at 7,800 feet for its very flat top, pinkish in young leaf, below which are exposed rather bare spreading branches, with usually a dependent fringe of grey lichen. Rare eastwards except on higher exposed sholas where it takes the place apparently of E. Arnottiana but commoner westwards.

Syzygium Jambolanum formerly Eugenia jamb. : *DC.* ; *F.B.I.* II 499, VIII 106. Sometimes quite a large spreading tree. Leaves oblong, ovate to lanceolate, obtuse or slightly acuminate, coriaceous, smooth and shiny. Panicles open with rather widely diverging branches, lateral or in the axils of the uppermost and fallen leaves. Flowers numerous, ultimately in cymes. Calyx lobes and petals 4, white or pinkish. Stamens white. Fruit purple, variable in size. **t. 170.**

Nilgiris : Coonoor Lamb's Rock Road, etc., common ; Biccapatti valley and below Kotagiri. Pulneys : below Kodaikanal.

Gen. Dist. Wild and cultivated throughout India, Malaya, Australia.

MELASTOMACEÆ.

Herbs, shrubs or trees with opposite leaves and usually very showy flowers, characterized by the conspicuous anthers, which may be long and open by pores at the top, or short and open by slits, but are set at an angle to the top of the filament and may have projections or outgrowths at the base. Stamens equal to or double the petals. Ovary inferior. Fruit a capsule or berry ; seeds small. Leaves often with 3 to 7 main veins from the base, but also penni-nerved.

Species about 1,800 chiefly in the tropics of South America and Asia ; a few also in Africa and Polynesia.

KEY TO THE GENERA.

(*a*) Leaves with three or more main veins. Petals four or five.
Shrubs ; anthers large ; calyx hairy and with a hairy growth between the sepals . . . . . OSBECKIA.
Similar to OSBECKIA, but anthers with knobs at base (cultivated only). . . . . TIBOUCHINA.
Epiphytic shrubs with small flowers . . MEDINILLA.
(*b*) Leaves three-veined. Petals 3. Inflorescence scorpioid. Shade-loving herbs . . . . SONERILLA.
(*c*) Trees. Leaves penni-nerved. Flowers small. Anthers curved, and with projections at the base . . MEMECYLON.

OSBECKIA. F.B.I. 60 I.

Mostly woody plants, shrubs of 2 to 10 feet, with purple flowers, conspicuously long and pointed bright yellow anthers curving downwards from the tops of the filaments, and very bristly calyx tube, which as in all the family encloses the ovary and fruit. Leaves opposite, shortly stalked : blades with five to seven main veins starting at the base and curving forwards to meet in the tip : joined by numerous straight cross-veins ; but with

no ordinary network. Stamens all equal: filaments with a pair of small yellow swellings just below the anthers (distinction from the native MELASTOMA and the garden TIBOUCHINA or PLEROMA). Ovary entirely enclosed in the calyx tube, and opening by four or five holes in the flat top. Seeds curved, minutely punctate.

An eminently Indian genus, nearly all of the 30 species being confined to this country, most of them to the hills.

Some or all of the bristles of the calyx tube are tufts or combs, combs pointing upwards on short or long stalks, and the number and nature of these, whether covering the whole calyx or only towards the top, are important characteristics of the several species.

KEY TO THE SPECIES.

a { Petals 4, anthers blunt; flowers pink and white: herb. O. cupularis.
Petals usually 5, anthers pointed, shrubs . . . . . *b*

b { Hairs of calyx tube all simple, hairs on upper side of leaf attached almost their full length . . . O. lineolata.
Lower hairs of calyx tube simple, upper comb-tufted *d*
All hairs comb-tufted . . . . *e*

c { Flowers purple: Leaves and calyx densely hairy: fruit about ½ inch . . . . O. Wightiana.
Flower pink: Leaves and calyx not very hairy. . . O. Sp.

d { Comb-tufts of calyx stalked: branches reddish, fruit nearly ½ inch globose, leaves usually 1 inch. O. leschenaultiana.
Comb-tufts very broad, sessile: fruit nearly ¾ inch, leaves up to 3 inches ovate . . . O. reticulata.

Osbeckia cupularis *Don*; *F.B.I.* ii 514, I 2. A small plant, growing in grass, with slender yellowish branches and white flowers blotched with pink on the outside.

Herbaceous from a perennial rootstock. Bark thin and scaly; stem and younger branches four-angled, yellowish and hirsute with erect hairs, as also the upper surface of the leaves and the veins on the underside.

Leaf-stalk $\frac{1}{10}$ to $\frac{1}{8}$ inch; blade $\frac{1}{2}$ inch, ovate-elliptic, drying yellowish, with three to five nerves curving from base to apex. Flowers in close bunches on tall slender branches with a pair of leaves just below. Calyx $\frac{1}{4}$ inch, deep red inside and partly on the outside too, with bristles of the lower half simple of the upper comb-like; teeth four, about $\frac{1}{10}$ inch, alternating with long-stalked tufted or comb-bristles and ending each in a few long hairs. Petals four, spreading, white with blotches of pink on the outside. Stamens eight: their filaments slender, white: anthers $\frac{1}{16}$ inch. Fruiting calyx tube $\frac{1}{3}$ by $\frac{1}{5}$ inch campanulate, nearly white and at length glabrous; mouth $\frac{1}{8}$ inch across, encircled by a fairly wide band: capsule inside opening by four holes and not protruding above the mouth. **t. 171**. Wight Ic. 996. (O. Leschenaultiana.)

Quite common in long grass, near sholas; flowering when the first rains begin. Pulneys: on the downs near Kodaikanal. Nilgiris: Ootacamund downs.

Gen. Dist. Mountains of South India from Coorg southwards to Ceylon.

Osbeckia lineolata *Gamble.* A shrub, branchlets slender, glabrous, glaucous. Leaves drying yellow, broadly elliptic, three-nerved; nearly smooth but strongly lined on the upper surface by the hairs being adnate for nearly their whole lengths. Flowers capitate or racemed purplish red. Calyx bristles all simple, except at the tips of the triangular appendages. Capsule $\frac{1}{3}$ inch campanulate.

Pulneys: near Perumal. Nilgiris: S.W. downs, Bangitappal, etc. These hills only.

Osbeckia rosea *Fyson* ? A small shrub. Branches square, thinly covered with erect hairs. Leaves ovate-lanceolate, three-ribbed. Hairs on upper surface sparse

adnate about one-third their lengths, on lower surface slightly adnate. Cymes dense, terminal. Calyx bristles in tufts of 3 or 4, the tufts sessile ; appendages of calyx unusually long, and narrowed upwards. Petals about ½ inch pink, with no trace of purple. Anthers hardly attenuate upwards. **t. 172.**

Nilgiris : at Coonoor on roadsides, common. Flowers, in September.

I have described this as a new species in Jour Indian Bot. Soc. XI-1-1932.

Mr. Ranga Achariyar, who was in charge of the Madras Herbarium at Coimbatore, tells me that this plant has hitherto been regarded as a variety of O. octandra, and was apparently so considered by Gamble in the F.M.P. pt. 3, for no reference is made to it ; but that he himself thinks it is probably a good species. The petals and calyx lobes, as may be seen in the figure, vary from 4 to 5, on the same plant. The colour is quite distinctly a pure pink, whereas O. octandra is described in G.F.M.P. as having purple flowers and the leaves are much broader.

Osbeckia Wightiana *Benth. ; F.B.I.* ii 519, I 17 ; distinguished by its silky leaves, white on the under side ; calyx shaggy with simple hairs not stalked comb-bristles, and handsome flowers.

A well-branched shrub 4 to 8 feet high ; younger branches rough with short stiff hairs or their semi-persistent bases ; youngest very hairy. Leaves ovate-oblong, 2 by ¾ inch (1½ to 3 by ½ to 1½ inches), closely covered with short silky hairs. Flowers one to five clustered, nearly sessile : bracts ⅓ by ¼ inch, ovate-acute, silky. Calyx tube ⅓ inch, covered thickly with straight hairs ⅛ inch long, and in the upper part from stalked scales. Corolla 1¾ to 2 inches, purple, handsome. Anthers ⅓ inch. Style 1 inch, prominently curved, and thickened at the stigma. Fruits in short racemes, marginal teeth strongly ciliated. **t. 173.** Wight Ic. t. 998.

Pulneys : on the Kodaikanal downs and down to 4,000 feet at Poombari. Nilgiris : Kotagiri and below.

Gen. Dist. South India and Ceylon.

The plant is very hardy growing to 8 feet on what appears to be almost bare rock and on the Pulneys is almost always to be found at the base of bare rock-slopes. On the Nilgiris it is much less common.

Osbeckia Leschenaultiana *DC.*; *F.B.I.* ii 520, I 18; Red Osbeckia. Distinguished from the other purple flowered species by its smaller habit and narrower leaves and red branches.

Branchlets square; older roundish, with two opposite pairs of ridges decurrent from the leaves; covered with spreading hairs. Leaves sessile, $\frac{3}{4}$ to $1\frac{1}{4}$ by $\frac{3}{8}$ to $\frac{5}{8}$ inch, ovate, narrow or broad, acute, sparsely hairy on both sides, but more so on the veins of the lower. Main veins three and a much fainter marginal pair. Flowers in dense tri-chotomous heads: pedicels $\frac{1}{8}$ inch. Calyx tube densely clothed with brown stalked bristles. Corolla $1\frac{1}{2}$ to 2 inches, purple. Petals five. Filaments $\frac{1}{2}$ inch, anthers $\frac{1}{4}$ inch, acuminate. Fruiting calyx $\frac{1}{3}$ by $\frac{1}{5}$ inch, thickly set with comb-bristles with stalks of $\frac{1}{20}$ inch, and bristles nearly as long. Ovary five-celled; opening ciliate with simple hairs of $\frac{1}{20}$ to $\frac{1}{12}$ inch. **t. 174.** Wight Ic. t. 997 (*O. Gardneriana*), not Ic. t. 996.

Common, on banks by sholas and on rocks. Flowering December to June. Pulneys and Nilgiris only.

Osbeckia reticulata *Beddome*; *F.B.I.* ii 520, I 20; Giant Osbeckia. A small tree, distinguished by the very shaggy branchlets, the large shaggy or silky leaves, with an immense number of cross-veins joining the seven main ones, and the coarse comb-tufts which completely cover the calyx tube.

Height 4 to 10 feet. Young branches four-angled covered with closely appressed hairs and at the nodes shaggy. Leaves ovate-lanceolate, or ovate, $1\frac{1}{2}$ to $2\frac{1}{2}$ by

$\frac{3}{4}$ to $1\frac{1}{2}$ inches, but in the shade and on young shoots reaching 5 by 3 inches; with seven main nerves and numerous almost horizontal cross-veins, $\frac{1}{16}$ to $\frac{1}{8}$ inch apart; densely covered with long brown silky hairs between the veins on the upper side, and on the veins of the lower: stalk $\frac{1}{4}$ to $\frac{1}{2}$ inch shaggy. Flowers large in umbellate clusters of three or four at the ends of the branches, their stalks $\frac{1}{4}$ inch long, joined across the branch by a line of bristles. Calyx tube $\frac{3}{8}$ inch, nearly hemispherical, densely clothed by bristly scales: lobes oblong obtuse, $\frac{1}{5}$ inch, contorted and overlapping to the left, ciliate and tipped each by a large stellate hair, and with a very densely tufted comb-tuft between each two, but soon falling and leaving a truncate mouth. Stamens large, the anthers $\frac{3}{8}$ inch long, with two small semi-circular flap-like appendages at the base. **t. 175.**

Near and in sholas and by roadsides. Pulneys: flowering May, a distinctive feature of some of the roads of Kodaikanal. Not Nilgiris.

Gen. Dist. Also Anamalais (where first collected by Col. Beddome).

TIBOUCHINA. F.B.I. 600.*

Tibouchina semicandra *Cogn.* (*Pleroma* of Triana); O * I. Planted in gardens, in Ootacamund; has the leaves of O. reticulata but the calyx tube covered with simple erect hairs, not comb-bristles; and the anthers with two appendages near the base. Bot. Mag. t. 5721.

A native of Brazil, and known as Brazilian Spider Flower. *Ger.* Thee-elpe.

MEDINILLA. F.B.I. 60 XVI.

Erect, scandent or epiphytic shrubs. Leaves ribbed from the base. Flowers in terminal panicles or axillary cymes, white or pink, five or rarely six-merous.

Medinilla malabarica *Bedd.* ; *F.B.I.* ii 548, XVI 8. An epiphytic sub-scandent shrub. Petioles, bases of the leaves, peduncles and the large flowers all brilliant crimson. Leaves 3 to 3½ inches by 1½ inch, elliptic lanceolate, acute at both ends, thinly fleshy. Flowers 1 to 3 on a peduncle, in axillary fascicles. Petals 4. Anthers short.

Nilgiris : 3,000 to 7,000 feet. Also Anamalais.

SONERILA. F.B.I. 60 X.

Herbs with opposite leaves, 3 to 5 nerved from the base. Flowers in racemes or scorpioid spikes and remarkable for the parts being all in threes ; three short calyx teeth, three showy petals, three stamens with anther-cells slightly divaricate at the base, and a three-celled ovary with single style and numerous ovules on axil placentas. Fruit an obovoid capsule opening in three valves.

Species about 60 in tropical India and Malaya. On the Nilgiris and Pulneys they are rare but occasionally met with in cultivation.

The name is taken from the Kanarese.

KEY TO THE SPECIES.

a {
- Stem erect. Leaves thin, with arching or pinnate nerves, thick stem and mauve flowers . . . . S. elegans.
- Stem erect. Leaves fleshy . . . . *b.*
- Stem creeping . . . . S. pulneyensis.
- Stemless, leaves orbicular, deeply cordate. S. rotundifolia.

b {
- Leaves ovate, seven to eight-ribbed. Calyx glandular. S. speciosa.
- Leaves, lanceolate, three-ribbed. Calyx glabrous . . S. grandiflora.

Sonerila speciosa *Zenk.* ; *F.B.I.* ii 534, X 20. Stem nearly or quite glabrous. Leaves petioled, 2 to 3 by 1½ to 2 inches, ovate-acute, finely serrate, with 5 to 9 basal

nerves which curve forwards and meet at the apex. Upper flowering portion of the stem hirsute, red, bifurcating cymosely into two one-sided racemes. Calyx tube with much brown hair. Petals ovate-acute, pink. Capsule definitely but lightly six-ribbed. Seeds numerous, with raised points and a large raphe, like a hood at one end. **t. 176.** Wight. Ic. t. 995-2. Sp. Nilg. t. 67-2.

In moist places, near Avalanche, etc. Flower February [*Wight*].

Sonerila grandiflora *Wall.; F.B.I.* ii 535, X 21. Stem woody below, round, with numerous prominent leaf-scars. Leaves elliptic, acute at both ends, finely serrate. Flowers crowded in short, one-sided racemes. Calyx tube glabrous, in fruit funnel shaped. Petals $\frac{3}{4}$ inch, elliptic acute. **t. 177.** Wt. Sp. Nilg. t. 67.

Nilgiris : S.W. downs by streams Bangitappal, etc. Also Pulney and Anamalai hills, at 6,000 feet.

Sonerila elegans *Wight; F.B.I.* ii 535, X 22. Herbaceous. Leaves ovate-acuminate, 2 to 4 inches, penninerved. Peduncles terminal, bifurcating cymosely into long one-sided racemes. Petals $\frac{1}{2}$ inch, ovate-acute. Capsule scabrid. Seeds with prominent raised points. Wight Ic. t. 995-3; Sp. Nilg. t. 67·3.

Nilgiris : Sispara, 6,000 feet.

Sonerila rotundifolia *Bedd.; F.B.I.* ii 535. A small stemless plant. Leaves round, deeply cordate, up to 1 inch diameter. Peduncles bright red, $1\frac{1}{2}$ to 3 inches, with 1 to 4 flowers. Flowers mauve, capsule short hemispherical, glabrous.

Nilgiris and Anamalai hills, 4,000 to 6,000 feet.

Sonerila pulneyensis *Gamble; Kew Bulletin*, 1919, *p.* 226. Stem fleshy, creeping, rooting. Leaves fleshy,

ovate, with spine-tipped serrations, acute at both ends, $\frac{3}{4}$ to 2 by $\frac{1}{4}$ to $1\frac{1}{4}$ inches, with 5 basal nerves. Cymes axillary of 2 to 5 flowers on pedicels $\frac{1}{4}$ inch long on a common peduncle of $1\frac{1}{4}$ to $1\frac{3}{4}$ inches. Flowers unknown. Capsule campanulate, $\frac{1}{3}$ to $\frac{2}{3}$ inch, pale. Seeds surrounded with conspicuous raphe.

Pulneys : in the Pambar ravine. *Bourne* 1341.

MEMECYLON. F.B.I. 60 XXI.

Trees with opposite leaves and numerous quite small flowers in axillary bunches, usually blue with bright yellow anthers which have a horn-shaped projection behind. Ovary one-celled, with eight radiating grooves. Fruit a small one-seeded berry, usually thick on the branchlets.

Species about 100, in south-east Asia, tropical Africa, and a few in Polynesia and Australia.

KEY TO OUR SPECIES.

(*A*) *Flowers sessile or nearly so.*

a { Leaves sessile, cordate at base, curved . . . . . M. malabaricum.
Leaves shortly stalked, acute at the base. . . . . *b*.

b { Leaves green when dry : calyx above ovary shallow . . M. Lushingtonii.
Leaves yellow when dry : calyx above ovary campanulate. M. flavescens.

(*B*) *Flowers in peduncled cymes.*

Leaves yellow when dry, under 2 by $\frac{3}{4}$ inch . . . . . M. molestum.

Memecylon malabaricum *Cogn.;* formerly M. amplexicaule *var.* malabarica ; *F.B.I.* ii. 559. XXI 24. A small tree, common in sholas under the shade of others

distinguished by its curved sessile leaves and clusters of small flowers with pink or crimson calyx, light blue petals and stamens. Leaves 2 to 3 inches Flower-clusters sessile. Fruit $\frac{1}{4}$ inch pink. **t. 178.**

Nilgiris : very common on the Eastern plateau. Kotagiri, Baccapatti, Kodanad. Pulneys : in or near Kodaikanal.

Memecylon amplexicaule of Roxburgh was founded on a plant collected in Penang.

Memecylon Lushingtonii *Gamble* in *Kew Bull.* 1919. *p.* 227. A small tree or shrub. Leaves shortly stalked, oblong elliptic obtuse, notched at the apex, about 1$\frac{1}{2}$ by $\frac{5}{8}$ inch. Cymes dense sessile. Flowers pale blue. Calyx above ovary saucer-shaped. Berry $\frac{1}{5}$ inch, otherwise as in the following.

Nilgiris : near Coonoor below 6,000 feet [*G.F.M.P.*] (not seen).

Gen. Dist. From the Ceded Districts southwards on the lower hills. Horsleykonda.

Memecylon flavescens *Gamble ; Kew Bull.* 1919, *p.* 226. A large shrub with many branches, usually obovate yellowish leaves, pale blue flowers and greyish berry $\frac{1}{3}$ inch diameter. Branchlets slender, nodose, rough, the youngest often quadrangular. Leaves elliptic or elliptic-obovate under 2 by 1 inch. Tubercles bearing the flowers small. Flowers shortly pedicelled. Bracteoles lanceolote. Calyx above the ovary campanulate ; disc rays obscure.

Nilgiris : Kundahs, between Avalanche and Sispara in sholas at and above 7,000 feet [*G.F.M.P.*] (not seen).

Memecylon angustifolium *Wt. F.B.I.* ii 562, XXI 37. At our levels a tall tree. Leaves narrow, lanceolate about 3 by $\frac{1}{2}$ inch, petiole $\frac{1}{2}$ inch quite glabrous and opaque

(veins not visible). Inflorescence dense purplish blue. 'Calyx tube saucer-shaped, disc clearly but not thickly rayed. Berries black purple.' Wt. Ic. t. 276.

Shevaroys: Green Hills by stream.

Gen. Dist. Hitherto described as a shrub and as from near Courtallam in Tinnevelly only. I was unable to get either the flowers or the fruit as they were beyond my reach, but I have no doubt that this is Wight's plant.

LYTHRACEÆ.

The family of LYTHRACEÆ is a medium-sized one of 200 to 300 species and includes LYTHRUM (*L. salicaria*, the Purple Loosetrife); LAGERSTRŒMIA (*L. Flos-reginæ* and *L. indica* common in Madras gardens); and the Pomegranate.

AMMANNIA *and* ROTALA.

Small often aquatic herbs with opposite entire exstipulate leaves and the ovary free in the membranous deeply hollowed calyx tube. Flowers crowded. Corolla usually pink or absent; stamens equal to or twice as many as petals, capsule very thin, opening in two valves each with its own style (ROTALA) or irregularly (AMMANNIA).

Species about 38, mostly in the warmer parts of Asia (21) and Africa (17); also in Australia and Central Europe.

ROTALA is a Linnæan genus combined later with AMMANNIA, also LINNÆAN but again separated. See Engler's *Pflanzenreich* IV, 216 *Lythraceæ*, s. 40.

KEY TO THE SPECIES.

Leaves roundish: flowers sessile pink. . . R. rotundifolia.

Leaves $\frac{1}{8}$ inch, ovate-cordate reddish: flower spring (appendix). . . . . R. Fysonii.

Leaves narrow, cordate at base; flowers in dense sessile axillary clusters on short branches: capsule opening in two valves . . . . A. baccifera.

Leaves narrow, acute at base : flowers axillary on short leafy branches : capsule opening irregularly. . R. densiflora.

Rotala rotundifolia *Kochne ;* formerly Ammannia rotund : *Ham. ; F.B.I.* ii 566, I 3 ; a small herb growing by the waterside, with opposite leaves $\frac{1}{2}$ inch long, and dense terminal spikes of small pink flowers in the axils of green bracts.

Stem often creeping at the base, 3 to 8 inches. Leaves $\frac{1}{2}$ to $\frac{1}{5}$ inch long and a little narrower, subsessile, round or obovate, very obtuse, penni-nerved. Racemes terminal, dense bracts green, $\frac{1}{2}$ inch, broadly ovate acute, adnate to the pedicel : bracteoles very narrow. Calyx $\frac{1}{10}$ to $\frac{1}{8}$ inch long and broad, membranous with four triangular teeth. Petals four, obovate twice as long as the tube, attached to it between the teeth. Anthers round. Fruit a septicidal capsule showing when ripe very close and fine horizontal striations. **t. 179.** Wight Ic. t. 258.

On the margin of the lake at Kodaikanal, very abundant. In damp places generally on the Kodaikanal and Ootacamund downs.

Gen. Dist. India, Ceylon, Malacca, South China, Formosa, etc.

Ammannia baccifera *Linn. ; F.B.I.* ii 569, I 11. Herbs of marshy places. Stem leaves 1 to 2 inches by $\frac{1}{8}$ and $\frac{1}{4}$ inch, cordate at base : leaves of lateral branches smaller. Flowers in peduncled corymbs. Sepal triangular. Capsule opening irregularly.

Shevaroys : Green Hills and at lower levels to the plains in all districts.

Rotala densiflora *Kochne ;* Ammannia pentandra, *Roxb.* in *F.B.I.* ii 568, I 10 in part only. Similar in general habit to the last species but leaves acute at base, flower clusters sessile, and capsule opening in two valves.

Shevaroys: in swamps on Green Hills and lower to the plains in all districts.

CUPHEA.

An American genus of about 160 species.

Cuphea pinetorum *Benth.* A slender-stemmed sticky plant, with red tubular drooping flowers remarkable for a pair of round black petals which fold back erect from the narrow mouth of the crimson coloured calyx. All young parts, pedicels and calyx glandular-pubescent. Leaves narrow lanceolate, $\frac{1}{2}$ to 2 inches long, with midrib and nerves impressed on the upper side. Flowers on pedicels of $\frac{1}{2}$ inch, in axillary fascicles, forming compound leafy racemes. Calyx $\frac{3}{4}$ to 1 inch, widest at the base, and prolonged below in a short sac; teeth small. Petals 4; 2 lower small red; upper $\frac{1}{6}$ inch across black, round stamens 8, inserted inside the calyx and a little below the mouth. Ovary free at the base of the calyx, four-celled, with one style and small stigma. Fruits $\frac{1}{2}$ inch with seeds in four rows on an axile placenta which bursts through the calyx when ripe. **t. 180.**

Coonoor, Kotagiri, etc., as a garden escape on roadsides, under hedges. Other species also occur.

ONAGRACEÆ.

Herbs with opposite or alternate undivided but toothed leaves and mostly solitary flowers, characterized by the inferior ovary of two or four cells: sepals and petals two or four and stamens two, four, or eight.

Species 300 to 400 all over the world but especially in the north temperate zone.

Common garden and wild European plants are FUCHSIA CLARKIA, OENOTHERA, EPILOBIUM (Willow herb), CIRCÆA (Enchanter's Nightshade).

ŒNOTHERA.

Evening Primrose.

Herbs with erect stems well clothed with alternate simple but often much cut leaves. Flowers terminal, solitary, often large ; with very long calyx tube continued as a tube above the ovary in long sepals ; four very thin petals, twisted in bud ; eight stamens with long conspicuous, anthers ; a four-celled ovary containing many seeds, and four long narrow spreading stigmas (§ *Ewœnothera*). Fruit a four-angled or four-winged capsule opening by four valves.

The extra tropical species were monographed by S. Watson in " Contrib : Amer : Bot. I. p. 573." As given in the Gen. Plant, the genus has over 100 species, nearly all in America, outside the tropics. In science the genus has become famous because of a theory of evolution which De Vries founded mainly on the great variations in a species which has run wild in Holland. These *mutations*, as he called them, were he considered differences of sufficient importance to warrant the plants being considered new species, and mainly on this evidence, but with that of other mutations too, he founded his theory of evolution as being brought about, not by the slow accumulation of small (fluctuating) variations as C. Darwin suggested, but by big changes which once made do not vary back to the original form. His theory has been vigorously opposed by the older followers of Darwin, particularly Alfred Russell Wallace. Many, however, of those who have worked on and support Mendelian methods in the study of inheritance are inclined to support him.

OE. odorata *Jacq.* Flowers yellow, scented at night.

OE. tetraptera *Cav.* Flowers white, 2 inches ; capsule winged. **t. 181.**

OE. rosea *Ait.* Flowers pink, 1 inch. **t. 182.**

FUCHSIA. 62 III.*

Herbs shrubs or small trees with pendent usually reddish or purple flowers solitary in the leaf-axils, remarkable for the very long calyx tube carrying the four sepals, four petals and eight stamens well beyond the ovary.

Style single with capitate or lobed stigma. Fruit a berry.

Species 60, natives of Mexico and the western side of South America ; one or two also in New Zealand. Much cultivated in English gardens.

Fuchsia corymbiflora *Ruiz and Pav* : * A coarse shrub with ovate oblong leaves acute at both ends and terminal racemes of magenta-red flowers, with calyx-tube of 2½ to 4 inches scarlet pointed sepals and petals. **t. 183.**

Common on roadsides in Ootacamund : introduced as a garden plant.

CIRCÆA. F.B.I. 62 IV.

Small herbs with alternate ovate or sinuate or toothed leaves, and small flowers of two sepals, two petals, two stamens, and one or two cells to the ovary, each with one seed only.

Species under 10, in Europe, Asia, temperate and arctic North America.

Circæa alpina *Linn. ; F.B.I.* ii 589, IV 3 ; Enchanter's Nightshade. Stem 2 to 6 inches, pubescent or nearly glabrous, seldom branched below the racemes. Leaves ¾ to 1¼ inches, sinuate-serrate, cordate or abruptly narrowed at the base ; lower leaf-stalks longer, upper shorter than the blades. Racemes short, long peduncled, 2 to 6 inches. Flowers ⅛ inch. Fruiting pedicels stiffly horizontal ; fruits 1½ inches, obovoid, covered with hooked hairs. **t. 184.** Wight Ill. t. 101.

In woods and shaddy places.

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* Incorrectly named. F. fulgens in my Fl. N. & P. Ht. F. fulgens as ovate cordate-toothed leaves and sepals greenish at tip.

Gen. Dist. Temperate climates of the northern hemisphere. (*Ger.* Hexenkraut, *Fr.* Herbe de S. Etienne.)

The flowers face downwards and are visited by small hovering flies. To get the honey secreted round the base of the style they must hold on to the stamens and style. The latter being the longer is touched first and so receives pollen from the underside of the insect's body. Later on the visitor, in sucking the honey, catches hold of the stamens and rubs against the anthers. Self-pollination would occur by the bending of a stamen against the stigma. (*Koerner.*)

SAMYDACEÆ.

A small tropical family the SAMYDACEÆ allied to the Passion-flower, Papaw, Begonia and Melon, but differing from these in its two-ranked or bifarious gland-dotted leaves, small clustered flowers, persistent sepals, and by the large fleshy lacerate aril of the seeds.

CASEARIA. F.B.I. 63 I.

Species 80 in warm climates especially of America.

Casearia coriacea *Thu.* ; *F.B.I.* ii 592, I 4. A tree with yellowish-white smooth bark, obovate gland-dotted leaves, and small groups of nearly sessile petalless flowers close down in the leaf-axils or orange yellow fruits, ¾ inch long, which stand on a frill of the persistent sepals.

Tree, 20 feet or more high, branches glabrous. Leaves standing to right and left (bifarious though spirally arranged), elliptic or obovate, entire, acute or acuminate, tapering to the base, thick, dotted with translucent dots and streaks ; petiole ¼ inch, blade 2 to 3½ inches by 1 to 2 inches. Flowers in the axils of the present or fallen leaves, pedicels ⅛ inch. Calyx $\frac{1}{10}$ inch, glabrous, with four to five round, concave lobes. Stamens eight, with minute, round anthers ; mixed with shorter oblong

staminodes, villous at the top. Ovary one-celled, with one very short style : ovules many on parietal placentas. Fruit orange-yellow, glabrous, the $\frac{1}{5}$ inch ; stalk jointed near the base and marked there by a raised ring ; at first fleshy, but opening when dry in three thick valves. Seeds many, covered by a large red fleshy and lacerate aril.

Kodaikanal downs in Gundattu shola.

Gen. Dist. On the Western Ghauts from Bombay southwards, Ceylon and the Malaya Peninsula.

Vernacular name, *Vella Kunnan*, Malayalam ; *Mori*, Mar.

PASSIFLORACEÆ.

A family of some 300 species, the greater number belonging to the genus.

PASSIFLORA. F.B.I. 641.

Passion-flower.

Shrubs or herbs, twiners or tendril-climbers. Leaves simple, entire or lobed, stipulate, stalked. Flowers solitary or in cymes peduncled in the leaf-axils, with three bracteoles. Sepals, petals and stamens five. Ovary and stamens borne on a stalk well above the rest, and this stalk surrounded at the base by a single or double corona, composed of a membranous cup and a ring or rings of slender filaments. Anthers oblong, unusually large, versatile. Ovary one-celled, with three parietal placentas ; style with three branches. Fruit a berry.

A large genus, natives mostly of America ; a few also in Asia and Australasia.

a { Leaves entire, half-moon shaped . . . P. Leschenaultii.
a { Leaves three-lobed . . . . b.
b { Lobes entire : stipules $\frac{3}{4}$ inch . . . . . . P. calcarata.
b { Lobes toothed or crenate : no stipules . . . P. eduis.

Passiflora Leschenaultii *DC.; F.B.I.* ii 599, I 1. Leaves semi-circular attached at the middle of the rounded margin with a cuspidate point in the opposite side, glabrous : stalk ½ inch ; nerves five all from the base, the three middle ones very straight to the opposite centre and corners. Tendrils axillary. Peduncles in pairs in the leaf-axils, 1½ to 2 inches, jointed ½ to ⅓ below the flower : bracteoles three, linear. Sepals ¾ inch, oblong obtuse. Petals as long, but narrower, white. Outer corona of two rows of linear filaments, the outer row shorter than the petals, the inner much shorter and more slender. Inner corona a much folded membranous cup ; and inside this again a small shallow cup round the base of the column. Fruit ovoid 1½ inches. **t. 185.** Wight Ic. t. 39. *Vern.* Covayonkou.

Common, climbing on the outer trees of a shola. Pulneys : near Kodaikanal. Nilgiris : Ootacamund, Kotagiri, Coonoor.

Gen. Dist. Also Khasia.

Passiflora calcarata *Mast.*; I 2; Madagascar Passion-flower. A slender climber with three-lobed leaves and large stipules ¾ to 1 inch by ½ inch which distinguish it at once from all our others. Corona, an outer set of slender filaments, white with purple base and blue tips ; and an inner set of much shorter ones which fit closely round the central column and cover a honey-secreting circular channel formed by the dipping downwards of the calyx tube. Ovary egg-shaped, green, with a slight bloom : stylar arms spreading upwards and outwards, and ending in large two-lobed stigmas. **t. 186.**

A garden escape. Nilgiris : near Ootacamund and Naduvattam. Shevaroys : Flowering March to May. What appears to be a variety with much narrower lobes to the leaf (1½ by ¼ inch) occurs on the Shevaroys.

A native of Madagascar belonging to the section GRANADILLA of the genus.

Passiflora edulis *Sims.* ; I 4 ; edible Passion fruit. A nativeof Brazil, has gone wild below Kodaikanal, near Ootacamund and near Yercaud. **t. 187.** Bot. Mag. t. 1989.

It has larger leaves than the last species and the lobes irregularly serrate all round.

Tacsonia mollissima *H. B. & K.* with a long tube below the pink sepals and petals and velvety leaves is grown in gardens. It is a native of Peru. **t. 188.**

CUCURBITACEÆ.

Melon, Marrow, Pumpkin, Bryony, etc.

Weak-stemmed, often scabrid herbs, climbing by tendrils, which may be simple or branched and usually spring from a little to one side of a leaf-axil. Leaves stalked, lobed but not compound. Flowers white or yellow, unisexual, monœcious (both kinds on the same plant) or diœcious. Petals often quite united. Stamens typically five with one-celled (i.e., half) anthers ; more often apparently only three, two having two half anthers each (i.e., a pair fused), anthers rigid on the filaments, straight or doubled in an " S " curve. Ovary inferior, one-celled with three parietal placentas. Fruit a berry with firm rind and enlarged juicy placentas : seeds many, flat.

Species about 400, mostly in the warmer parts of the world especially the tropics. The family has been put by many systematists among the Monopetalœ, because of the often quite typically monopetalous flower not unlike that of a CAMPANULA. Cultivated plants of the family include the Melon, Marrow and Pumpkin. The bathroom " luffa " is the dried placentas of a wild species.

KEY TO THE GENERA.

Anthers S-shaped ; petals $\frac{1}{2}$ inch or more with long fringe. TRICHOSANTHES.
Anthers S-shaped ; petals short ; leaves simple . MELOTHRIA.
Leaves compound, pedate . . . . GYMNOSTEMMA.

TRICHOSANTHES. F.B.I. 65 II.

Flowers diœcious, male in racemes, female solitary.

Distinguished from all others of this order very easily by the petals, which are deeply cut into long fimbriæ. Anther cells doubled back. Fruit smooth.

Species 42, India, Malaya, Australia. T. Anguina *Linn.* is the Snake Gourd of the plains.

Trichosanthes villosula *Cogn.* A stout climber with very hairy stems and large white flowers. Male racemes with small bracts. Ovary and calyx tube of female nearly 2 inches. Fruit ovoid-acuminate, $2\frac{1}{2}$ inches long.

The flower opens after dark and is strongly and sweetly scented. In bud the petals (corolla lobes) are folded to the centre with the fimbriæ folded inside, making five radiating ridges. **t. 189.**

Nilgiris : in deep valleys below Coonoor-Karteri stream —5,000 to 6,000 feet.

T. palmata *Roxb. ; var.* tomentosa *Heyne ; F.B.I.* ii 606, II. Male racemes with large laciniate bracts. Leaves scabrid. A woody climber.

Nilgiris and Pulneys 3,000 to 6,000 feet. Also Mysore Hills [*G.F.M.P.*].

Gen. Dist. (of species) Himalayas to Ceylon, Japan and north Australia.

MELOTHRIA. F.B.I. 65 XVII.

Including ZEHNERIA *and* MUKIA.

Slender and weak-stemmed herbs. Flowers small white or yellow, monœcious or diœcious. Male flowers

in racemes or corymbs. Calyx campanulate with five short teeth. Corolla deeply five-partite, petals not toothed. Stamens three: anthers usually free, oblong or sub-orbicular, free. Female flowers solitary, fascicled or corymbose. Calyx and corolla as of the male. Staminodes three. Ovary egg-shaped, globose or pear-shaped. Style short, surrounded by an annular disc. Fruit a small berry. Seeds usually margined.

Species about 40 all in the tropics.

Very similar to BRYONIA White Bryony, *Fr.* Couleuvrée, *Ger.* Zaünrube (Black Bryony is quite distinct).

Name taken from the Greek name for Bryony.

The genus now includes ZEHNERIA and MUKIA which were formerly considered as distinct.

KEY TO THE SPECIES.

Stamens with long filaments.

Flowers monœcious; berry globose $\frac{1}{4}$ inch . M. perpusilla.

Flowers diœcious: berry oblong . . . . M. mucronata.

Anthers sessile.

Fruit globose $\frac{1}{2}$ inch or more: striped white and green . . M. leiosperma.

Melothria perpusilla *Cogniaux; F.B.I.* as Zehneria hookeriana *Arn.*, ii 624, XVI 2; Kodai Bryony.

Stem slender herbaceous: tendrils from one side of the leaf stalks. Leaves angular, sharply lobed. Flowers in small corymbs, peduncled in the leaf-axils; pedicel $\frac{1}{8}$ inch; peduncle $\frac{1}{4}$ to $\frac{1}{2}$ inch: female flowers $\frac{1}{4}$ inch, male flowers $\frac{1}{5}$ inch, crowded. Fruit globose. **t. 190.**

In thickets and sholas, common on the downs. Pulneys: as high as Kodaikanal and above. Nilgiris: Pykara, Kotagiri.

Gen. Dist. Mountains of South India, south-east and central Himalayas, Assam, Khasia to Sikkim and Nepal.

Melothria mucronata *Cogn.*; *F.B.I.* ii 624. Leaves cordate, five-angled or lobed and irregularly toothed. Flowers diœcious, berry long-oval.

Nilgiris and Pulneys up to 7,000 feet [*G.F.M.P.*].

Melothria leiosperma *Cogn.*; *F.B.I.* ii 623, as Mukia leiosperma *Wt.* A scabrid climbing herb with unbranched tendrils. Leaves angular, not deeply lobed. Flowers small, solitary. Corolla five-lobed. Stamens of male flowers 3, anthers straight two two-celled, one one-celled. Female flowers like the male, small campanulate. Fruit golobose, green with white markings, seeds few. **t. 191.**

Nilgiris: near Coonoor, etc. Pulneys at Shembaganur.

The fruit might be likened to the familiar peppermint "bull's eye."

GYMNOSTEMMA.

A genus of one or few species.

Gymnostemma pedata *Blume.*; *F.B.I.* ii 633, XXVIII 1. A slender climber with simple tendrils and pedately compound leaves. Leaflets ovate-lanceolate. Flowers minute, in diffuse axillary panicles, 3 to 6 inches long, greenish. Male and female corolla both rotate, five partite. Stamens 5, united below; the anthers straight two-celled (i.e., normal). Fruit $\frac{1}{6}$ inch diam., greenish, one to three-seeded.

Nilgiris, 4,000 to 6,000 feet [*G.F.M.P.*].

Gen. Dist. Eastern Himalayas to Ceylon, Malaya and Japan.

BEGONIACEÆ.

BEGONIA. F.B.I. 65.

Only genus. Name in honour of M. Bagon, a French botanist.

Succulent herbs or undershrubs with alternate, asymmetrical and toothed or lobed leaves. Flowers unisexual, monœcious, usually pink or white, showy, in peduncled dichotomous cymes. Perianth of two outer coloured sepals with or without two inner smaller petals. Male flowers : stamens numerous, the filaments free or connate. Female flowers : ovary inferior three-celled and three-winged. Fruit a three-winged capsule with numerous small seeds.

Most are perennial herbs with thick rhizomes.

Species about 400.

Many are cultivated for their beautiful flowers and foliage, the horticulturist dividing them into two groups, "Rex" and "Tuberous." They reproduce readily by the leaves, pieces of which if placed in damp sandy soil give rise to buds and roots.

Begonia malabarica *Lamk.*; *F.B.I.* ii 653, I 64. Almost shrubby. Leaves cordate, very unequal-sided. Flowers rose-coloured, no petals in male. Capsule $\frac{3}{4}$ inch long and broad, the wings unequal.

Pulneys : at foot of Silver Cascade, etc., Nilgiris.

Gen. Dist. Western Ghauts, to 6,000 feet.

Begonia floccifera *Bedd. F.B.I.* ii 654. Leaves nearly circular, toothed. Flowers many on a tall scape. Sepals of male flowers 2. Capsular wings sub-equal. Broadest at the middle.

Nilgiris : Kaity valley [P. V. Mayuranathan].

Gen. Dist. Hills of Tinnevelly and Travancore.

UMBELLIFERÆ.

A large family characterized chiefly by the flowers being in compound umbels (umbels of umbels), with inferior ovary which always splits into two one-seeded parts (mericarps). Herbs, usually strongly scented, with

hollow stems. Leaves nearly always much dissected or compound, and with large sheathing base. Sepals small or none. Petals folded down the middle, notched, usually white. Stamens five. Styles two. Mericarps with five ridges and sometimes others between them, and in the valleys between long oil cavities (vittas).

Species 1,300 mostly in the temperate regions of the Old World. Absent from North America and south of the Line.

HYDROCOTYLE and SANICULA have simple umbels and no vittas in the fruit, and are removed by some systematists into a family of their own. For distinguishing the genera importance is attached to the presence or absence on the mericarps of secondary ridges between the main ones; on the number of vittas between the ridges; and on the shape of the fruit and mericarps, whether these are widest at the split and flat; or equally thick as wide; or narrowest at the split and therefore flattened at right angles to it.

Familiar members of the family are the Carrot, Celay, Parsnip, Fennel, and Coriander and Carraway.

KEY TO THE SPECIES.

(*A*) *Umbels simple.*

Creeping herbs, flowers few HYDROCOTYLE and CENTELLA.
Erect herbs, umbels irregular . . . . . . SANICULA.

(*B*) *Umbels compound.*

Leaves narrow, grass like: flowers yellow: fruits thick . . BUPLEURUM.
Basal leaves broad, cordate: flowers white: fruits narrow . PIMPINELLA.
Leaves mostly much divided, flowers white: fruit flat . . . HERACLEUM.

HYDROCOTYLE *and* CENTELLA. F.B.I. 70 I.

Small herbs prostrate and rooting at the nodes. Leaves long stalked with small scarious stipules, roundish, angular or lobed, cordate (or slit behind the point of attachment),

palmately nerved. Umbels simple, small. Flowers usually 3, only white or red. Fruits compressed at right angles to the plane of division, i.e., splitting faces narrow : no vittas.

Species about 70 in wet and damp places, especially in the southern hemisphere. A few in Europe : Pennywort, *Ger.* Wassernabel.

The two genera are separated by the fruit.

That of HYDROCOTYLE having 3 ridges, that of CENTELLA 7 or 9 primary and as many secondary, to each mericarp.

a	Leaves $\frac{1}{4}$ inch	Hydrocotyle rotundifolia.
	Leaves 1 inch kidney-shaped . . .	Centella asiatica.
	Leaves 1 inch or more deeply cordate, lobed and toothed.	*b*
b	Umbels on peduncles of $\frac{1}{2}$ inch or more . .	H. javanica.
	Umbels on peduncles of $\frac{1}{8}$ inch only. . . .	H. conferta.

Hydrocotyle javanica *Thumb.* ; *F.B.I.* ii 667, I 1. Stem succulent, pubescent below the nodes, with erect branches up to 6 inches. Leaves $1\frac{1}{2}$ to 4 inches, nearly circular, with five to nine triangular lobes, these again five to seven-lobed or crenate ; hairy above on the veins only, pubescent underneath : stipules entire : stalks on the prostrate stem up to 10 inches, on the erect branches 1 to 2 inches. Flowers small, pale green, nearly sessile and crowded on very slender peduncles of $\frac{1}{2}$ to 1 inch, fascicled in the leaf-axils. No sepals. Petals with incurved tips. Fruits $\frac{1}{6}$ by $\frac{1}{12}$ inch broader than long ; mericarps compressed, with five primary but no secondary ridges. **t. 192.** Wight Ic. t. 1003.

In shady places and woods on the downs. Pulneys : Kodaikanal. Nilgiris : common.

Gen. Dist. Mountains of India and Ceylon, Burma. Absent or very rare on the Bombay Ghauts to the north of us.

Hydrocotyle conferta *Wight* ; *Kew Dist.* *No.* 1158 ! *F.B.I.* ii 668, I 3. Very similar in general appearance

to H. javanica, but peduncles in fruit quite short, o to $\frac{1}{4}$ inch; mericarps smooth not compressed, in section pentagonal; stem more slender. **t. 193.** Wight Ic. t. 1002.

Pulneys: below Kodaikanal, head of Pallangi valley above Villappatti and down to 5,000 feet. Nilgiris; in Ootacamund, in wet places.

Gen. Dist.} Not elsewhere.

Hydrocotyle rotundifolia *Roxb.; F.B.I.* ii 668, I 4. Stems slender. Leaves $\frac{1}{4}$ to $\frac{3}{8}$ inch, deeply divided into five to seven lobes, each with two or four rounded teeth. Umbels peduncled. Petals minute reddish. **t. 194.**

Common on bare damp black soil and in bogs, in the open. Everywhere on the downs.

Gen. Dist. Mountains of India and Ceylon and Malaya.

Centella asiatica *Urban; F.B.I.* ii 669, I 5; formerly Hydrocotyle asiatica *Linn.* Rootstock vertical, stout, 3 to 4 inches. Stem wiry, rooting at the nodes: stipules adnate to the leaf-stalks. Leaves kidney-shaped? $\frac{3}{4}$ by 1 to 1 by $1\frac{1}{2}$ inches, or larger in the shade, with round crenulations. Peduncle $\frac{1}{2}$ inch; no pedicel. Flowers few in the umbel, pink: bracts ovate-concave, two to an umbel. Ripe mericarps $\frac{1}{8}$ inch, showing both primary and secondary ridges. **t. 195.** Wight Ic. t. 565.

On bare, even gravelly soil and in grass; in the opens very common.

Gen. Dist. Throughout India and tropical and sub-tropical countries generally.

SANICULA. F.B.I 70 III.

Erect herbs characterized by the umbels irregular and globular, not flat-topped, and the fruits covered with hooked bristles.

Species 30. Europe, Asia, Atlantic and Pacific sides of North America, Mexico, Chili, highlands of tropical Africa, the Cape, Sandwich island. *Ger.* Heilknecke.

Name said to be from the Greek SANO, *I heal, because of its medicinal properties.*

Sanicula europæa *Linn.*; *F.B.I.* ii 670, III 1; Wood Sanicle. Rootstock perennial. Radical leaves on long stalks, three-foliate; leaflets ovate-lanceolate acute, serrate or bristle-toothed, thin, glabrous sometimes again deeply cut or lobed. Stems 1 to 1½ feet, nearly or quite leafless or with small three-fid bracts at the branchings. Flower-heads in groups of about three, sessile at the forkings and at intervals on the branches of a broadly spreading cymose panicle. Fruits covered with long hooked bristles. t. **196.** Wight Ill. t. 117, fig. 2; Ic. t. 334 and 1004.

In shady places, sholas, etc. Pulneys: near Kodaikanal and down to 5,500 feet.

Gen. Dist. Higher mountains of India and Ceylon; not on the lower hills nor on the Bombay Ghauts.

BUPLEURUM. F.B.I. 70 VII.

Hare's-ear.

A genus remarkable in this family for its entire and for the most part grass-like leaves. Mericarps not compressed, with no secondary ridges, and with one to three vittas in the valleys.

Species 60 in the temperate regions of the Old World. One in South Africa, one in Arctic North America. In Europe we have Hare's-ear, Thorowax; *Ger.* Hasenohr.

Leaves 4 to 10 by ¾ to 1 inch . . . . B. plantaginifolium.
Leaves 2 to 6 by ¼ inch or more . . . . . B. mucronatum.
Leaves ½ to 2 by $\frac{1}{16}$ to ⅛ inch, grass-like . . . . B. distichophyllum.

Bupleurum plantaginifolium *Wight; F.B.I.* ii 675, VII 1; Giant Hare's-ear. A tall perennial herb up to 4 or 5 feet with stem towards the top, where all the leaves are as thick as a stout lead-pencil; base bare. Leaves with broad base half encircling the axis, then narrowed and widening gradually into the blade, which may be 10 inches long and over 1 inch wide; oblong-lanceolate, acute at both ends, strongly mucronate, with prominent midrib and five to eight slender nerves starting from near the base, and running at a very acute angle to meet the margin near the apex; upper leaves crowded, shorter to ovate, obtuse but mucronate, with much less distinct midrib. Umbels in branched panicles, with conspicuous elliptic mucronate bracts at the forkings: bracts of the umbels four to five, $\frac{1}{4}$ inch, three to seven-nerved, oblanceolate, mucronate; pedicels $\frac{1}{4}$ inch. Petals yellow, reflexed. Mericarps $\frac{1}{4}$ to $\frac{3}{8}$ inch by $\frac{1}{16}$ to $\frac{1}{8}$ inch, prominently five-ribbed, slightly curved towards the inner, flatter, side. **t. 197.** (*b*) an unripe fruit. Wight Ic. t. 281.

Nilgiris: near Ootacamund on Snowdon, Elk Hill, etc. Fruiting October to July; Coonoor. Not collected on the Pulneys. *Bourne* 4635.

Gen. Dist. Not elsewhere.

Bupleurum mucronatum *Wight and Arnott; F.B.I.* ii 676, VII 8; common Hare's-ear. A slender green stemmed, sometimes tall and well branched herb, with narrow grass-like erect leaves and terminal panicles of yellow-flowered umbels. Fruits with five prominent ridges, and in the furrows one to two vittas.

Gen. Dist. Mountains of South India and Ceylon.

* **type**: *Herb. Wight Prop.* 1197! Stem usually 2 feet, but may be as tall as a man and much branched. Leaves

2 to 7 inches by $\frac{1}{4}$ inch, linear oblong or oblanceolate, mucronate. Bracts of the umbellules narrow, acute. Fruits black. **t. 198.**

Pulneys: on the open downs frequent. Nilgiris. *G.F.M.P.* says "scarce on Pulneys."

** *var.* **ramossima** *Wight ; Herb. Prop.* 1198. Stem $\frac{1}{3}$ inch thick with prominent ridges at the nodes, excessively branched upwards. Leaves comparatively short and broad, 1 to $2\frac{1}{2}$ inches by $\frac{1}{6}$ to $\frac{1}{3}$ inch, but also 4 by $\frac{1}{3}$ inch oblanceolate, obtuse, mucronate. Main peduncles of the umbels $\frac{1}{2}$ to 1 inch, slender; secondary peduncles $\frac{1}{4}$ to 1 inch filiform: involucral bracts prominently oblanceolate mucronate. Fruit $\frac{1}{6}$ inch. Wight Ic. t. 1007.

Nilgiris: near Ootacamund. Pulneys and Shevaroys [*G.F.M.P.*].

*** *var.* **virgatum** ; *Herb. Wight Prop.* 1165 (*from Ceylon*). Stem simple or nearly so below, twiggy. Leaves about $\frac{1}{8}$ inch by 2 inches. Rootstock a tuber, 1 inch thick. Fruit markedly ellipsoid, often $\frac{1}{8}$ inch only.

In grass on the Kodaikanal downs, near Gundattu shola, Lidcot valley and the road to Lone Cottage.

This variety is restored to specific rank as B. virgatum W. and A. in *G.F.M.P.*, but I regard it as a dry ground form.

Bupleurum distichophyllum *Wight and Arnott ; Herb. Wight Prop.* 1196*! ; F.B.I.* ii 677, VII 9. Stem slender, 4 to 8 inches. Leaves narrow, 1 to 2 inches, grass-like mostly crowded and closely imbricated clasping the lower part of the stem, which may be there $\frac{1}{12}$ inch thick; upper few, smaller and merging into the $\frac{1}{3}$ inch bracts. Bracts of umbels $\frac{1}{4}$ inch finely acuminate, longer than the rays. **t. 199.** Wight Ic. t. 1006.

On the open downs: Nilgiris at Ootacamund (*Bourne*) flowering July, and below Avalanche. Pulneys: above Kodaikanal.

Gen. Dist. These hills only. *Fyson* 1839*a*. *Bourne* 4624.

PIMPINELLA. F.B.I. 70 XIII.

Our three species are distinguished from all others of the family by the large heart-shaped basal leaves, with stalks of 4 to 12 inches. (Most of the genus however with much divided leaves.) Stem slender. Lower leaves occasionally lobed: but upper bractiform leaves deeply cut or divided into three to five wedge-shaped segments with long clasping base. Umbels compound (of the usual type): peduncles about $\frac{3}{4}$ inch, bracts linear $\frac{1}{3}$ inch. Flowers white, $\frac{1}{8}$ inch across or less: petals slightly unequal. Mericarps narrowest across the division, contracted above, bulging below so that the pair appear in side view heart-shaped, each with five ridges and two or three oil ducts in the shallow furrows.

The above refers to our three species. The differences between them lie in the texture and toothing of the leaves (more pronounced in the upper ones), and the hairiness of the fruit. They may also be distinguished on the Pulney downs by the fact that *P. candolleana* grows on the open hill-side, *P. pulneyensis* in the cooler damper parts near sholas.

Species 75, all over the world except Australia. (In Europe Burnet Saxifrage, Anise.)

KEY TO THE SPECIES.

Fruit pappilose . . . . P. candolleana.
Fruit glabrous—
  Nilgiri plant . . . . P. leschenaultii.
  Pulney plant . . . . P. pulneyensis.

Pimpinella Candolleana *Wight and Arnott ; F.B.I.* ii 687, XIII 14. Stem usually unbranched, except near the top, from 1 to 2 feet in height, pubescent. Lower leaves sharply and regularly toothed, softly hairy on both sides ; veins often reddish below : for the most part stiffly erect though the lowest may be spreading. Bracts of the flowering branches without petioles, but with long clasping bases, palmately three to five-fid ; the segments sharply and coarsely toothed, with mucros. Flowering branches divaricating at angles of about 30 degrees : peduncles 1 inch : the compound umbels flat in flower, rounded in fruit : bracts $\frac{1}{3}$ inch. Filaments white with brown or violet anthers. Styles white, in early fruit spreading and tipped by the violet, stigmas. Fruit papillose. **t. 200.** Wight Ic. t. 341.

Pulneys : very common in the grass of the open downs, flowers freely May to September. Nilgiris : on the downs near Ootacamund to Coonoor, flower September.

The leaves have a faint smell of Aniseed.

•**Pimpinella pulneyensis** *Gamble ; Kew Bull.* 1919, *p.* 228. Stem often branched 2 to 5 feet high, red in the lower parts and clothed with fairly long white hairs, which are conspicuous also on the leaf-stalks. Leaves somewhat flaccid, spreading, more or less hairy, with irregular and blunt teeth ; the lowest entire, but often some three-lobed or three-foliate. Upper bractiform leaves palmately three-fid ; the segments again divided, and these again bluntly toothed. Peduncles rather under $\frac{3}{4}$ inch. Bracts none ; bracteoles few, linear. Filaments white, with brown anthers. Styles at first white, afterwards turning brown, or dark purple. Fruit quite glabrous and smooth. **t. 201.** Wight Ic. t. 1005.

Pulneys : in damp or cool places near sholas, flowering May to September.

Pimpinella Leschenaultii *DC.* ; *F.B.I.* ii 687, XIII 13. Stem 12 inches only, basal leaves two or three only, roundish, 1 to 1½ inches diameter, lying flat on the ground. Toothing of these, and upper leaves and fruits as in the previous species. Bracts none; and bracteoles $\frac{1}{6}$ inch.

Nilgiris : on the open dry hill-sides springing up and flowering in May after the first rains.

These last two species were, for want of a name to the first, placed together as form of P. leschenaultii in my first edition with the following note :—

" These two forms are very unlike in general appearance. One might suspect their differences to be due only to differences of habitat. But while the Nilgiri plant grows in the open, and not I think in the shade ; the Pulney plant I have never seen except near sholas, its place in the open being taken by P. candolleana."

Gamble has misquoted me in his Flora of the Madras Presidency (though not in the Kew Bulletin) transposing the habit of the Pulney plant to the Nilgiri.

HERACLEUM. F.B.I. XXXIII.

Cow Parsnip.

Distinguished among our genera by the mericarps being much broader than thick (widest at the division), and when quite ripe often flat and winged by the extra large lateral ridges : by the obscure middle ridges, and between them solitary vittas which are prominent when dry, three or four only to each mericarp, and usually extend from near the top not quite to the base, being thicker downwards.

Very large herbs with wide spreading flat compound umbels, of which the outermost flowers have usually very conspicuous petals especially on the outer side (" radiate umbels ").

Species about 70, mostly in temperate Europe and America (*Fr.* Berce, *Ger.* Herkuleskraut).

In some of the species considerable variation occurs and also differences between the upper and lower leaves it is not easy to determine and define the species from dried herbarium material. Considerable confusion had therefore crept in, and in the first edition I expressed uncertainty about the exact distribution of some of the forms. H. hookerianum *W.* & *A.* appeared to be a young form of H. rigens *Wall* and H. candolleana of Wight's herbarium not the same as H. candolleana of Wight and Arnott's Prodromus. H. pedatum *Wight* differs from the others in its fruit.

KEY TO THE SPECIES.

a	Flowers white : inside vittas 2 only	*b*
	Flowers yellow : inside vittas 2 or 4	*c*
b	Lower leaves simple	H. Hookerianum.
	Lr. ls. pinnate. Large marsh plant .	H. ceglanicum.
	Lr. ls. pedate. Small woodland plant . .	H. pedatum.
c	Lower leaves pinnate, lobes rounded . . .	H. rigens.
	Lower leaves pinnate, lobes acute	*d*
d	Fruit $\frac{1}{3}$ by $\frac{1}{4}$ inch or more : outside vittas nearly to base .	H. Candolleanum.
	Fruit $\frac{1}{4}$ by $\frac{1}{5}$ inch outside vittas three-fourths of face inside very unequal	H. Sprenjelianum.

Heracleum Hookerianum *Wight and Arnott ; Herb. Wight Prop.* "Avalanche"; *F.B.I.* ii 715, XXX 14. Leaves nearly all on the ground. Stem and branches of umbel and bracts sticky with glandular hairs 1 to 1½ feet. Petals white, pinkish on the back, some radiate. Ic. t. 1010.

Nilgiris : on downs from Snowdon to Avalanche, etc.

Heracleum rigens *Wall. Cat. No.* 575 *! ; F.B.I.* ii 75 (in part), XXXIII 15 ; common Cow Parsnip of the Kodaikanal downs.

Rootstock stout, stem puberulous or pubescent. Leaves of three to five leaflets. Leaflets and their lobes rounded, margin serrate or dentate. Rays of umbel

numerous (fifteen to thirty), 2 to 3 inches : pedicel $\frac{1}{2}$ inch, sepals green with pink tips. Petals creamy yellow, anthers dark reddish purple. Mericarps when fresh half as thick as broad, $\frac{1}{3}$ to $\frac{1}{2}$ inch, broadly elliptic, brownish red or pink, drying flat: inside vittas four, slender extending half to three-fourth down, as regards width occupying the middle half of the fruit, i.e., in two very close pairs. **t. 202.** Wight Ic. t. 1009.

On the open downs in dry places. Pulneys : fairly common. Nilgiris : Ootacamund to Coonoor.

Heracleum ceylanicum *Gardner, Thwaites Enum* 131 *C.P.* 145 ; *F.B.I.* ii 716, and H. rigens *var.* candollena, ii 716 ; XXXIII 17. " Queen Anne's Lace." Basal leaves pinnate. Leaflets, oblong, twice or thrice as long as broad ; lateral lobes and segments rounded, terminal, acute ; pubescent or tomentose, dentate. Rays 2 to 4 inches. Petals pure white, large, especially the outer mericarps very large, $\frac{5}{8}$ by $\frac{1}{3}$ inch : vittas occupying one-third of the breadth, convergent below. Umbels very strongly radiate, the largest petals obovate or obcordate, $\frac{1}{6}$ inch. A very beautiful plant. **t. 203.**

Pulneys : on the downs. Abundant on the Pulneys in moist valleys and by streams as soon as the rains begin.

Heracleum Candolleanum *Gamble : F.B.I.* as part of *var.* Condolleana of H. rigens. Stem glabrous below, pubescent under the rays. Leaves very large, over one foot. Leaflets cordate sessile or decurrent, acute, often irregularly lobed at the base, serrate on both sides, pubescent. Rays very numerous ; pedicels slender, $\frac{1}{2}$ inch. Mericarps broadly elliptic, $\frac{1}{3}$ by $\frac{1}{4}$ inch : vittas four on outside, two on inside, occupying half or more than half of the width, not convergent below.

Pulneys on the downs, common.

Heracleum Sprengelianum *W. & A. F.B.I.* ii. 716, XXXIII 18; Giant Cow Parsnip—a very large plant. Leaves very large, over 1 foot. Leaflets cordate sessile or decurrent, acute and acutely lobed, often irregularly at the base. Rays numerous. Flowers yellow, pedicels in fruit ½ inch. Mericarps elliptic ⅓ by ¼ inch. Vittas 4 on back, not reaching the base, unequal on inside. (*Gamble* gives the fruits as ¼ by ⅕ inch only). **t. 204.**

Pulneye: in grass on the downs and to Poombari.

Heracleum pedatum *Wight, Herb. Prop! ; F.B.I.* ii 716, XXXIII 20. Stem up to 18 inches, decumbent and rooting at the nodes. Leaves pedately divided into five leaflets, which are sharply serrate or deeply cut; lateral ones 1 by ½ inch, terminal 1½ by ⅞ inch. Main umbels on slender peduncles; rays few, final umbels ½ inch very radiate, the outermost petal three or four times the inner ones. Two outer sepals linear, long and spreading; inner obsolete. Petals white, triangular-cordate, deeply notched. Mericarps ⅛ by $\frac{1}{10}$ inch, broadest at the base, nearly as thick as wide, not winged but five-angled, ridges obsolete. Vittas one between each angle and two on the inner side. **t. 205.**

In sholas forming a dense growth. Pulneys: common, flowering June to September.

The fruits are more than those of a Sium than of a Heracleum. They mature late and cannot be found ripe before September. The foliage reminds one of that of the Wood Sanicle (Sanicula europæ).

ARALIACEÆ.

Shrubs and trees with digitately CHEFFLERA or pinnately (PENTAPANAX) compound leaves on stalks with broad sheathing bases. Flowers small, woody, in spikes. umbels or heads, which are again in racemes. Calyx

more or less enclosing the ovary and surmounted by five or six small teeth. Petals woody, valvate. Stamens as many. Ovary inferior or half inferior : cells five or six with one seed hanging from the top with micropyle facing upwards and outwards. Fruit fleshy or leathery with a few seeds.

Species about 400, mostly tropical.

Many of the family have a peculiar smell when crushed and are poisonous (e.g., Ivy). Species of ARALIA and PANAX are well-known garden foliage plants, showing under cultivation great variation in the cutting of the leaves. The family is allied to the UMBELLIFERÆ and might be considered its tropical representative, but with its peculiar characteristics much less fully developed. In Europe there is only the very common Ivy. *Ger.* Epheu, *Fr.* Lierre. On the plains species of ARALIA and PANAX are commonly cultivated as ornamental shrubs.

KEY TO THE SPECIES.

a
- Flrs. sessile in heads, racemed in stout peduncles . . . 1. Schefflera capitata.
- Flower stalked in branched racemes (panicles) leaflets 2 to 8 inches acuminate . . . . . 2. S. racemosa.
- Flower stalked in umbels . . . . *b*

b
- Umbels in branched racemes, venation of leaflets not prominent . . . . *e*
- Umbels in simple racemes . . . . *c*
- Umbels stalked in irregular terminal corymbs, leaves pinnate . . . . Pentapanase Leschenaultii.

c
- Peduncles stalks of racemes very stout. Lfts. to 10 inches leathery, venation not prominent . 3. S. Wallichiana.
- Peduncles slender leaflets to 4 inches ovate or obovate, venation very prominent . . . . *d*

d
- Leaflets obovate, rounded or notched . 4. S. stellata.
- Lfts. obovate or elliptic, shortly acuminate . S. venulosa.
- Peduncles of umbels with bracts below as if compound . *e*

e
- Leaflets ovate accuminate ; umbels 1 inch often one only with woolly bracts at intervals below . 6. S. rostrata.
- Umbels ½ inch, bracts glabrous . . . 7. S. micrantha.

PENTAPANAX. F.B.I. 71 II.

Climbers with pinnate leaves of 5 to 9 leaflets. Flowers in umbels, which are in simple or compound racemes. Pedicels jointed just below the flowers.

Species few in India only.

Pentapanax Leschenaultii *Seem.; F.B.I.* ii, *p.* 724. II 4. A tree with large pinnate leaves. Leaflets usually 5, 3 to 5 by 2 to 3 inches, ovate-acute, with fine bristle-tipped serration from base to apex, glabrous. Main branches of panicle 2 to 4 inches, again branched or simple. Umbels perfect, pedicels $\frac{1}{2}$ inch, jointed just below the flower. Fruits globose, $\frac{1}{6}$ inch, with persistent style; deciduous from the flat slightly expanded end of the pedicel.

Nilgiris: Doddabetta and in sholas on the western side, to 7,000 feet.

Gen. Dist. Also Sikkim and Burma.

SCHEFFLERA F.B.I. 71 VII AND IX.

(*formerly known as* HEPTAPLEURON *and including* BRASSAIA).

Large shrubs or trees, sometimes straggling, glabrous and without prickles. Leaves alternate, crowded near the ends of the branches: stalk with broad sheathing base extended up above the insertion (or stipules adnate to it and joined together above as in the POLYGONACEÆ): leaflets five to seven, stalked, entire or nearly so. Calyx teeth obsolete. Petals five to six or more, valvate. Stamens as many. Ovary more or less inferior and surmounted by a honey-secreting disc fully developed or aborted; cells of ovary as many as the petals, one-ovuled: styled columnar. Fruit subglobose.

1. **Schefflera capitata** *Harms*, formerly Brassaia capitata *C.B. Clarke ; F.B.I.* ii 732, IX 1. A low well-branched tree with palmately compound leaves and the flowers in dense sessile heads of six or seven, at the ends of comparatively short stalks standing out along the stout branches of a large terminal panicle.

Lenticels on the branches and leaf-bases very large, up to $\frac{1}{8}$ by $\frac{1}{16}$ inch. Leaf-base sheathing and continued above the insertion for $\frac{1}{2}$ inch as a triangular intra-petiolar stipule, covering the axillary bud. Petiole 7 inches : leaflets seven, their stalks 2 inches ; blade 6 by 2 inches, thick and firm, glossy on the upper side, dull and light green on the under ; midrib very stout, brown ; veins very slender, but distinct on the upper side, both veins and the smaller reticulations distinct on the lower sides. Branches of panicle 14 inches, stout, in the axils of triangular acute $\frac{1}{2}$ inch bracts, dark purple in colour, and with scattered stellate hairs. Peduncles $1\frac{1}{4}$ inches, standing out almost at right angles from the main branches, bracts $\frac{1}{5}$ inch. Heads $\frac{1}{2}$ to $\frac{3}{4}$ inch wide, of about ten flowers. Buds round $\frac{1}{3}$ inch, sessile above three concave brown tomentose bracts. Petals six, valvate hard. Stamens as many, longer, bent abruptly inwards just below the anther ; anther opening inwards. Ovary bluntly conical, continuous with the disc at the base, in which are twelve small hollows containing glistening drops of honey ; no style ; cells six. **t. 206**.

Nilgiria : Pykara waterfall road, near the short cut to Glen Morgan estate : flowering May. Kotagiri and Vellyengry hill. Also Wynaad. Not collected on Pulneys.

2. **Schefflera racemosa** *Harms.*, formerly Hepta pleurum racemosum *Bedd.*, *F.B.I.* ii 729, VII 6. A

medium sized well-branched tree, easily distinguished in the shola by its bunches of hanging leaflets and its axillary compound spikes of small white flowers.

Main petiole 3 to 5 inches, leaflets 3 to 8 inches, elliptic, acuminate, with undulate margin ; smaller veins not conspicuous when dry. Branches of panicle puberous, in early stage often ending in an umbel of flowers, opening long before the lateral branches develop. Styles connate. Berries $\frac{1}{4}$ inch. **t. 207.** Wight Ic. t. 1015.

In sholas common. Pulneys : Kodaikanal downs and Shembaganur. Nilgiris : Coonoor.

Gen. Dist. Mountains of South India and Ceylon.

3. **Schefflera Wallichiana** *Harms.*, formerly Hept. Wall. *C.B. Clarke ; F.B.I.* ii 730, VII ii. Petioles of leaves very stout up to 1$\frac{1}{2}$ feet in length. Leaflets 8 to 12 inches by 2$\frac{1}{2}$ to 4 inches, leathery, oblong, acute or accuminate, entire ; veins not prominent. Peduncle stout : stalks of umbels 1$\frac{1}{4}$ inch, bracts caducous, umbels 1 inch, berry six-celled.

Belongs to lower levels, e.g., Courtallam, but occurs on these hills. My Kodaikanal specimen has a bluish bloom on the underside of the leaflets.

4. **Schefflera stellata** *Harms.*, formerly Hept. stell. *Gærtu ; F.B.I.* ii. 8, 730, VII 9. Distinguished among our species by the very slender branches of the inflorescences and the obovate strongly veined leaflets. **t. 208.** Wight Ic. tt. 1011-2.

Nilgiris and Pulneys up to 6,000 feet [*G.F.M.P.*].

Shevaroys : near Yercaud, etc.

5. **Schefflera venulosa** *Harms.*, formerly Hept. ven. *Seem. ; F.B.I.* ii. 729, VII 8. A large climbing shrub. Very similar to the last but with larger and more acute or acuminate leaflets. Berries orange.

Nilgiris on the Gudalur Ghaut and low levels. Wt. Ill. t. 118.

Gen. Dist. Deccan, Horsleykonda, etc., frequent on trees near villages [*G.F.M.P.*].

6. **Schefflera rostrata** *Harms.*, formerly H. rostratum *Bedd.*, *F.B.I.* ii. 729, VII 5. Leaflets 3 to 5 by 1 inch, narrowed at both ends, glabrous. Branches of panicle often bearing only one terminal umbel : nodes with persistent, tomentose or woolly bracts. Berries black, ¼ inch. Seeds 5, like segments of an orange.

Nilgiris : Kundhs, flowers May.

7. **Schefflera micrantha** *Harms.* : (H. rostratum *var.* micrantha *C.B. Clarke*), *F.B.I.* ii 729, VII 5. Similar to the last but leaflets 3 to 5, by 1½ to 2 inches, coarsely toothed. Bracts glabrous.

Nilgiris : on western edge, Naduvattum to Sispara [*G.F.M.P.*].

CAPRIFOLIACEÆ.

Trees, shrubs, or stragglers with opposite leaves joined by lines round the stem but no definite stipules : petals five, united at least at the base with a short tube : stamens as many : ovary inferior of two cells each with one pendant ovule : fruit usually a drupe.

Species about 200 mostly in the northern hemisphere. Western Europe has about 10 species. Honey suckle, Guelder Rose ; Elder (*Ger.* Flieder, *Fr.* Surean).

Flowers regular, in panicles . . . . VIBURNUM.
Flowers in pairs, with ovaries united . . . . LONICERA.

VIBURNUM. F.B.I. 74 III.

Trees and shrubs with opposite simple leaves, and characterised by the terminal rather flat-topped cymose panicles or corymbs of small white or cream-coloured

flowers, and the seeds of a flat oval shape with two more or less deep grooves lengthwise so that the cross section is a flat T or W shape and the inside a flat W.

Species 100 in temperate and sub-tropical regions, chiefly of Asia and North America. In Europe both wild and cultivated : Guelder Rose, Wayfaring tree (*Fr.* Viorne, *Ger.* Schlinge).

a { Corolla rotate (tube very short). V. acuminatum *DC.*
Corolla tubular with spreading lobes . . . . . *b*

b { Leaves entire : bracts not conspicuous. . V. coriaceum.
Ls. sinuate ; light green : bracts linear . V. hebanthum.
Leaves dentate with crimson stalks . . V. erubescens.

Viburnum acuminatum *DC.* ; *Wall. Cat.* 4651 *!* ; *F.B.I.* iii 5, III 7, as V. punctatum *Ham.*, *var.* acuminata ; III 7. * A small tree. Leaves elliptic, 3 to 5 inches long and usually less than half as broad, entire, acuminate, with recurved margins and covered on the underside with small round rust-coloured scales or glands ; as also the young parts : veins few. Flowers white in terminal, very regular, congested corymbs with peduncles 1 to 2 inches, fruiting corymbs more open. Drupe red elliptic or oblong $\frac{1}{3}$ by $\frac{1}{5}$ inch : seeds, much compressed, obscurely grooved. **t. 209.** Wight Ic. 1021 Bedd. Fl. Sylb. t. ccxvii.

Nilgiris : on the downs towards Pykara at 7,000 feet. Not Ootacamund. Pulneys : at lower levels, not Kodaikanal. Shevaroys : Green Hills abundant. The leaves are slightly smaller, and thicker than at higher levels.

Gen. Dist. Mahendragiri to Travancore in evergreen forest.

Viburnum coriaceum *Blume*, *var.* **capitellata** *Wight Herb. Prop.* as V. capitellata *W. & A. !* ; *F.B.I.* iii 6, III 9. A small tree with, usually, much lobed outline.

Twigs lenticelled. Leaves ovate-elliptic, acuminate, with almost acute base and waved or shallow-toothed margin, glabrous except for tufts of hairs in the axils of

the nerves on the underside. Panicles rounded : peduncles $\frac{3}{4}$ to 1 inch, dividing into threes : cymes umbellate. Flowers yellowish white nearly sessile, buds glistening : ovary $\frac{1}{16}$ inch : corolla tube $\frac{1}{6}$ inch ; lobes very small. Fruit $\frac{1}{3}$ by $\frac{1}{6}$ inch compressed. Seed, in cross-section a flat W-shaped. **t. 210.** Wight Ic. t. 1022.

On the margins of sholas.

Pulneys : below and about Kodaikanal and above on the downs, common. Nilgiris : on the Eastern plateau, Coonoor, Biccapatti.

Gen. Dist. South India and Ceylon.

Viburnum hebanthum *Wight and Arnott; F.B.I.* iii 6, III 10. A small spreading tree with rounded or lobed outline distinguished from V. coriaceum by the brighter green of its foliage and the very distinct linear bracteoles.

Branches with smooth grey bark heavily lenticelled. Leaves all erect in dense tufts at the ends of the year's shoots, elliptic or obovate, hardly acuminate, with sinuate or serrate margin, glabrous except for tufts of hairs in the axils of the, rather few, veins underneath ; stalk $\frac{1}{4}$ to $\frac{3}{4}$ inch. Corymbs of flowers flat-topped or rounded much as in *V. coriaceum* : its branches green, four-angled, sticky ; bracteoles $\frac{1}{5}$ inch, very conspicuous in bud, then withering and at length falling : buds $\frac{1}{8}$ inch green, nearly sessile, densely pubescent. Corolla tube $\frac{1}{8}$ to $\frac{1}{3}$ by $\frac{1}{30}$ inch, greenish ; lobes very small, erect. Stamens five, exserted, attached to the base of the corolla. Fruit ellipsoid, $\frac{1}{3}$ by $\frac{1}{6}$ inch, with the stylar point a little to the dorsal side, black but not shining and with a little yellowish powder. Seed, one only in the posterior cell, oval, with a sharp groove on the ventral side and two shallow ones on the dorsal, and so in section a shallow W-shape. **t. 211.**

On the outskirts of shola along with V. erubescens. Nilgiris : Ootacamund and below on the downs to Pykara, very common ; flowering March, but buds as early as June.

Not elsewhere.

Viburnum erubescens *Wall.* (in the first edition as *var.* **wightiana** *Wall. Pl. As. Rar.* ii 293. *Cat.* 3729) ; *F.B.I.* iii 7, in part III 15 * ; a roadside or hedge-row shrub distinguished by its laxly spreading forked white-barked branches, crimson leaf-stalks and drooping racemes. Bark on the younger branches a light pinky grey colour, smooth and shining, but with obscure lenticels. Leaves few, rather stiff, stalks crimson, pubescent with stellate hairs, as also are the veins of the lower side : blades broadly ovate or obovate, serrate except the broad rounded base, with often a short triangular or cuspidate point ; midrib pinkish, nerves about six on either side. Flowers in open panicles of cymes, curving downwards in bud, 2 inches long, when the flowers fully open with pinkish or pale green branches. Pedicel or calyx tube, $\frac{1}{16}$ to $\frac{1}{8}$ inch dark green ; calyx of five minute triangular teeth. Corolla campanulate ; tube $\frac{1}{5}$ inch, white ; lobes $\frac{1}{20}$ inch, sulphur or cream-coloured, imbricate. Stamens attached to the mouth and alternating with the lobes. Fruit one-celled, $\frac{1}{5}$ by $\frac{1}{4}$ inch, usually erect, ovoid or obovoid, red and shining crowned by the thick short style ; section of the stone a flat W. t. 212.

Differs from the type species in the broader leaves the stellate pubescence on their stalks and the drooping panicles. White Ic. t. 1024. Gamble has dropped the variety.

On roadsides and the edges of sholas. Pulneys : about Kodaikanal at 7,500 feet, not common. Nilgiris : in and about Ootacamund, common, flowering during the winter months.

Wallich's species *V. erubescens* was founded on a Nepal plant shown in his figure (Pl. As. Rar. ii. t. 134) and also described as having erect

panicles. His Cat. Nos. 459 and 7474 are slenderer plants with not the same laxly drooping habit and narrower leaves. His *V. wightianum* distinguished as a separate species differs, according to his description, chiefly in the leaves being broader and stellately pubescent below. I find also the panicles drooping. *Erubescens* is a good name for our plant; its leaf-stalks are so red.

LONICERA. F.B.I. 74 VI.

Shrubs erect or straggling characterized by the flowers being in close pairs with ovaries almost or quite united.

Leaves opposite, entire: buds scaly. Pairs of flowers with a bract and usually also two bracteoles, peduncled in the leaf-axils (or in terminal heads or clusters). Sepals five, short. Corolla tube slender, often bulged at the base; lobes five, unequal or nearly equal. Stamens five, inserted on the tube. Ovàry of two or three cells; style long and slender with capitate stigma. Fruit a berry of two or three cells, with a few seeds.

Species about 80 in the temperate regions of Europe, Asia and America. Not in the southern hemisphere. In Europe we have the English common and Fly Honeysuckles, *Ger.* Geiss blatt, *Fr.* Chevre feuille.

Straggling plant. Corolla 1 to 2 inches . . L. Leschenaultii.
Erect shrub. Corolla $\frac{1}{2}$ inch. . . . . L. ligustrina.

The genus is divided into a number of subgenera and sections according to the habit of the plant, whether erect or straggling, the arrangement of the pairs of flowers, the bracts, the lobes of the corolla and other differences. Of our species *L. Lesch.* belongs to the § *nintooa* and *L. lig.* to § *isikia.*

Lonicera Leschenaultii *Wall., Cat.* 471 *!; F.B.I.* iii 10, VI 1; common Honeysuckle. A straggling climbing shrub with reddish brown bark on the main stem, and the younger parts, calyx and underside of leaves covered with short white hairs. Leaves broadly ovate to lanceolate, 2 to 3 by $1\frac{1}{2}$ to $2\frac{1}{2}$ inches, dull green above, whitish below. Pairs of flowers on peduncles of $\frac{1}{8}$ inch,

in the axils of the uppermost leaves, often forming terminal leafy bunches ; or occasionally the pairs solitary on short axillary branches. Calyx $\frac{1}{16}$ inch, and teeth $\frac{1}{20}$ inch white tomentose. Corolla white, turning cream colour, tube 1$\frac{1}{4}$ inches, slender, erect, as also in bud; upper lip 1 by $\frac{1}{8}$ inch, obtuse, curved back in a spiral ; lower four-lobed, slightly longer and less curved, $\frac{1}{4}$ inch wide at the top. Stemens long. Fruits in pairs, globular the size of a small pea, crowned by the calyx. **t. 213.** Wight III. ii. t. 120 (not 121-B.).

In thickets and straggling over small trees on the edges of sholas. Common. Nilgiris : Ootacamund and below, especially on the eastern plateau. Flowering profusely in May. Pulneys : below Kodaikanal at the level of Shembaganur, etc. Shevaroys : Green Hills, abundant.

Gen. Dist. South Indian mountains, Mysore, Coorg.

Lonicera ligustrina *Wall., Cat.* 479*! ; F.B.I.* iii 12, VI 9. Erect untidy shrub with grey bark ; branches numerous, ascending, tufted ; the youngest from a persistent sheath of decussate budscales, pubescent and purplish. Leaf-stalk $\frac{1}{8}$ inch, blade 1$\frac{1}{4}$ by $\frac{1}{2}$ inch or thereabouts, ovate, entire ; in bud erect and flat ; when young purplish with distinctly revolute and ciliate margin ; when older spreading and quite smooth. Flowers on the young shoots in opposite pairs, pendent : peduncle of a pair $\frac{1}{3}$ inch, axillary bracteoles $\frac{1}{8}$ inch linear : common, spherical part of calyx tube 1 inch ; free part $\frac{1}{40}$ inch with minute teeth : buds clavate. The two corolla tubes of a pair divergent, with a very distinct bend $\frac{1}{16}$ inch above the base, then erect and parallel, bulged at the bottom into a small sac outwards in each case ; lobes unequal, cream coloured. Styles of the pair bent abruptly inwards so that the stigmas nearly touch ; very hairy below. **t. 214.** Wight Ic. t. 1025 ; Ill. t. 121, B. 3.

In thickets and round sholas. Nilgiris : near Ootacamund and on the plateau generally. Pulneys : near Kodaikanal. Sometimes used as a hedge plant.

Gen. Dist. Khasia, Nepal and Western Ghauts.

RUBIACEÆ.

Trees, shrubs or herbs with opposite leaves connected across the branch on each side by one combined stipule (except in the tribe *Stellatæ*) and flowers solitary or in some form of cymose inflorescence, having an inferior ovary of two to five one-seeded or many-seeded cells ; calyx teeth four or five ; corolla monopetalous with as many equal lobes ; stamens as many ; and fruit dry, then a capsule or of cocci, or fleshy, then a drupe or a berry.

A very large family of some 350 genera and 4,000 species, distributed over the warmer parts of the world. Britain has four genera only, members of one small tribe, the *Stellatæ*, in which the stipules are not combined and may be divided and are enlarged to equal the leaves, so that at each node there is a whorl of four, six or eight leaves (Madder, Goosegrass, Bedstraw, Woodruff). With the exception of this tribe, the family can nearly always be recognized by the inferior ovary and the four stipules belonging to a pair of opposite leaves being combined into two connecting the leaf-stalks.

The family is divided into a number of tribes arranged in two main series : those with many seeds to each cell of the ovary (fruit a capsule or berry) and those with one seed only to each cell (fruit splitting into cocci or a drupe).

Common cultivated plants are species of CINCHONA (brought here from America for the quinine extracted from the bark), Coffee, IXORA (common in Madras gardens, with bunches of long slender scarlet corollas) and MORINDA (with the ovaries of several flowers coalescing). MUSSÆNDA, with one calyx lobe much enlarged like a white or yellow leaf, is common on the Ghaut road below Kodaikanal and Coonoor.

KEY TO THE GENERAL.

a	Leaves six at a node: narrow stem . . .	GALIUM.
	Leaves four at a node, heart-shaped, stalked . .	RUBIA.
	Leaves three; panicles terminal, large .	WENDLANDIA.
	Leaves two only at a node	*b*
b	Flowers in terminal cymose corymbs or panicles . .	*h*
	Flowers axillary, few or many, white	*c*
c	Herbs	*d*
	Shrubs	*e*
d	Flowers sessile	SPERMACOCE.
	Flrs. pedicelled or in peduncled umbels .	OLDENLANDIA.
e	Leaves or flowers fetid; corolla hairy at the throat . .	LASIANTHUS.
	Leaves not fetid; fruit fleshy	*f*
f	Seeds many; fruit crowned by the calyx-teeth .	RANDIA.
	Seeds 2 only	*g*
g	Corolla valvate in bud	CANTHIUM.
	Corolla twisted	COFFEA.
	Petals imbricate	STYLOCORYNE.
h	Lobes of corolla valvate in bud; herbs and shrubs . .	*i*
	Lobes of corolla twisted in bud; shrubs	*l*
i	Herbs: flowers pink, blue, mauve or white.	*j*
	Shrubs: flowers orange, one sepal enlarged like a white leaf	MUSSÆNDA.
	Shrubs: flowers white, or tinged with mauve	*k*
j	Stem and leaves very slender	OLDENLANDIA.
	Ls. fetid: seeds 1 or many: flowers pink or white	ANOTIS.
	Ovules 2 only, with cap at upper end: flowers usually blue	KNOXIA.
k	Capsule small: flowers white or tinged with mauve . . .	OLDENLANDIA.
	Capsule 1 inch long: petals ciliate: tree . .	CINCHONA.
	Capsule flat opening by a broad terminal mouth . . .	OPHIORRHIZA.
	Berry black: flowers white; style short . .	PSYCHOTRIA.
l	Flowers pink, tube slender; anthers linear; stigmas separate. Petals 4, seeds 2.	IXORA.
	Flowers white; stipules and lower bracts tubular; style very long. Petals 4, seeds 2	PAVETTA.
	Flowers white, stout: stigma long, undivided. Petals 5, seeds 4	CHOMELIA.

CINCHONA.

Trees or shrubs with petioled elliptic, or lanceolate leaves, and the inter-petiolar stipules glandular inside.

Flowers rose or yellowish-white, in dense or open cymose panicles peduncled in the upper leaf axils or terminal. Calyx small with 5 teeth. Corolla tabular below, with 5 spreading lobes very hairy on the margins. Anthers linear attached to the middle of the tube. Fruit a capsule splitting open from the base upwards. Seeds numerous.

Species about 30 in the Andes of South America.

The two commonest species planted and found scattered in hedges, etc., are—

C. ledgeriana *Moens ;* "Yellow bark." Leaves small, elliptic, rather leathery, and red underneath. Flowers golden. Capsule short, almost globular. This is the one richest in the alkaloid from which quinine is prepared.

C. succirubra *Pav. ;* "Red bark." Leaves thin up to 12 by 9 inches, calyx and corolla red. Capsule long.

WENDLANDIA. F.B.I. 75 XII.

Shrubs or small trees. Leaves opposite or in threes. Flowers small in dense thyrsoid terminal panicles, white or rosy. Calyx small. Corolla funnel-shaped with 4 or 5 spreading lobes, imbricate in bud. Stamens as many. Ovary inferior two-celled. Fruit, a small round capsule, with many seeds.

Species about 20 in tropical Asia.

Wendlandia notoniana *Wall.*, *F.B.I.* iii 40, XII 11. Sometimes only a herb, but also with thick woody base, and even a small tree. Leaves three at a node,

3 to 5 by 1 to 2 inches, entire, glabrous on the upper side pubescent on the lower; with 6 to 10 pairs of nerves and fine reticulation between. Panicle and young parts generally pubescent. Flowers white or pinkish. **t. 215.**

On the lower downs, about 6,000 feet, common larger.

Nilgiris: Pykara, Coonoor, etc. Not seen on eastern plateau; Biccapatti, Kodanad. Pulneys: Shembaganur. Shevaroys.

OLDENLANDIA F.B.I. 75 XX. XXXI.

(*including* HEDYOTIS).

Small herbs or shrubs (Hedyotis) with long bristles to the stipular cup. Flowers white or blue, in axillary or terminal cymes or panicles, or sometimes on axillary pedicels; calyx teeth usually well separated on the fruit; corolla valvate; stamens in the corolla tube or not far exserted; ovary two-celled: capsule thin-walled: seeds angular, many.

Species perhaps 200 in tropical and sub-tropical Asia.

KEY TO THE SPECIES.

a { Small herbs with narrow leaves: flowers white, solitary or in axillary umbels (OLDENLANDIA) . . . . *b*
Shrubs or stout herbs, flowers mauve or white; in terminal panicles (HEDYOTIS) . . . . *c*

b { Flowers solitary, branches very slender . . O. Heynei.
Flowers umbelled . . . . O. umbellata.

c { Stout herbs, without stem; leaves up to 6 by 3 inches . . O. verticilaris.
Small undershrub; leaves sessile; calyx lobes longer than tubes; flowers lilac . . . . . . O. swertioides.
Shrubs with flexuous branches; stipular bristles long . . O. stylosa.
Stiff shrub; stipules persistent; veins of leaf thick . . . O. articularis.

Oldenlandia Heynei, *Br.; F.B.I.* iii 65, XXI 3. All parts very slender. Peduncles axillary $\frac{1}{2}$ inch one-flowered. Corolla tube short, capsule $\frac{1}{10}$ inch, its crown much protruded. Seeds smooth. **t. 216.**

On all three plateaus common. Flower summer.

Oldenlandia umbellata *Linn.; F.B.I.* iii 66, XXX 5. Leaves fascicled, flat or almost needle-like. Flowers in small umbels, on axillary peduncles. Corolla tube short. Fruit $\frac{1}{12}$ in., crown of ovary low. Pres. Coll. Bot. Bull. No. 6.

Nilgiris: Coonoor, a weed from the plains.

Gen. Dist. South India, Burma, Ceylon.

Oldenlandia stylosa *O. Kze;* formerly Hedyotis stylosa *Brown*, in *Wall. Cat.* 853 *!; F.B.I.* iii 51, XX 8. A shrub with rather loosely growing flexuous branches, very variable in habit. Leaf-stalk $\frac{1}{4}$ inch; blade ovate-lanceolate or eilliptic, 1 to 5 inches long according to position and strength of shoot, glabrous or pubescent on the nerves underneath: stipular cup with three or four $\frac{1}{4}$-inch bristles. Capsule entirely within the calyx-tube, $\frac{1}{8}$ by $\frac{1}{12}$ inch, ellipsoid, splitting in two halves which open along their inside faces: calyx-teeth in fruit $\frac{1}{20}$ inch. **t. 217.** Wight Ic. t. 1027.

By sholas and in cool places. Pulneys: on the downs and below to Shembaganur, common. Nilgiris: on the downs, Ootacamund to Pykara and Sispara.

Gen. Dist. South Indian hills.

The place of the capsule is often taken by a fleshy gall the size of a small pea.

Oldenlandia articularis *Gamble*, formerly Hedyotis articularis *Brown*, in *Wall. Cat.* 854 *!; F.B.I.* iii 51, XX 9. A shrub characterized by its very close-set erect

narrow sessile leaves and, where the leaves have fallen, the rings of dried bristly stipular sheaths.

Leaves 1 by $\frac{1}{4}$ inch, lanceolate or elliptic lanceolate, rigid, glabrous or nearly so, with reflexed margin, and very broad nerves underneath. Cymes terminal, compact. Capsule $\frac{1}{8}$ inch, egg-shaped : calyx tube unaltered or occasionally lengthening to $\frac{1}{4}$ inch. **t. 218.** Wight Ic. t. 1028.

Nilgiris : on Elk hill near Ootacamund abundant. Pulneys : on the downs in hollows by streams, etc. ; flowers summer. Nowhere else.

Oldenlandia swertioides *O. Kze.*, formerly Hedyotis swertioides *Hook. f.* ; *F.B.I.* iii 51, XX 11 ; Ground Lilac. A small undershrub characterized by its stiff ovate leaves and dense terminal panicles of lilac-coloured flowers.

Height 1 to 2 feet, usually in tufts. Leaves sessile ovate, 1 to 3 inches by half as broad, erect, glabrous, firm. Cymes densely pubescent. Calyx lobes longer than the tube. **t. 219.**

Pulneys : on the downs above Kodaikanal, very common : flowers summer. Nowhere else.

Oldenlandia verticillaris *O. Kze.*, formerly Hedyotis verticillaris *Wight and Arnott* ; *F.B.I.* iii 56, XX 29. Stem short or none, as thick as the finger. Leaves numerous close-set, 4 to 6 by 1 to $2\frac{1}{2}$ inches, elliptic or lanceolate-oblong ; with three main and several minor parallel nerves. Flowers lilac to violet small in dense bunches in three-chotomous panicles on peduncles of 3 or 4 inches. **t. 220.** Wight Ic. t. 1029.

Nilgiris on the western downs near streams abundant in places.

Oldenlandia hirsutissima *O. Kze.*, formerly Hedyotis hirsutissima *Bedd.; F.B.I.* iii 55, XX 28. A low growing shrub with very stout stems and branches, and terminal tufts of hairy-yellowish leaves, from the axils of which spring erect peduncles of small flowers. Leaves 1½ by 1 inch ovate acute. Veins few.

Nilgiris: Western downs towards Sispara Ghaut; flower winter.

Oldenlandia purpurascens *Bedd., Ic. Pl. In. Or. t. V!; F.B.I.* iii 50 XX 6. A wooly shrub, similar to O. stylosa but differing in the nearly entire or gland-toothed ovate stipules, and the larger purple flowers though recorded so far only from Tinnevelly has been found near Coonoor (Mayuranathan).

Oldenlandia viscida *Bedd., Ic. Pl. Ind. Or. t. IV!; F.B.I.* iii 57, XX 35. A large handsome shrub with slender branches small triangular viscid stipules, and cymes both terminal and axillary forming large panicles with slender branches has been collected near Coonoor (Mayuranathan) but hitherto reported only from Tinnevelly.

ANOTIS. F.B.I. 75 XXII.

(*Our species only.*)

Herbaceous plants with evil-smelling leaves and peltate seeds, otherwise as in *Hedyotis*.

Species about 25, in the tropics of Asia and Australia.

a { Flowers pink. Stems weak usually creeping, in the open. . . . A. Leschenaultiana.
Flowers white, stems erect woodland and shade-loving plants . . . . *b*

b { Flowers small . . . . *c*
Flowers ½ inch, in close panicles . . . . . A. longiflora.

c { Peduncles of cymes long, capillary . . . A. monosperma.
Peduncles ¼ inch; hairy plant . . . . A. Wightiana,

Anotis Leschenaultiana *Wight and Arnott ; F.B.I.* iii 72, XXII 3. A small herb with ovate hairy leaves and flat bunches of pinkish purple flowers.

Whole plant except the corolla tube hairy. Stems weak and rooting at the nodes : stipular band joining the leaf-stalks bristly. Leaves ovate acute, with four or five pairs of rather broad hairy nerves on each side of the midrib, about $\frac{1}{16}$ inch apart, running very regularly to the margin and without connecting veins. Inflorescence regularly and cymosely trichotomous with minute toothed bracts. Pedicels $\frac{1}{16}$ inch, calyx tube $\frac{1}{20}$ inch ; teeth four, $\frac{1}{16}$ inch. Corolla tube $\frac{1}{4}$ inch, glabrous on the outside, very slightly hairy inside : lobes four spreading flat, $\frac{1}{12}$ by $\frac{1}{8}$ inch, stamens erect, the filaments white and attached to the backs of the small purple intorse anthers. Style slender : stigma bifid : top of ovary round and flat, not grooved. Capsule didymous, with hemispherical raised crown, two-seeded with one to eight seeds in each cell : seeds deeply pitted. **t. 221.**

Common on the downs.

Gen. Dist. Western Ghauts of South India.

var. 1 **type,** *Herb. Wight Prop.* 1398 ! ; leaves 1 inch or more, hairy : panicle 2 to 4 inches across, hairy : stipular bristles long. Stems erect or trailing, often on a bare sloping patch. *Wight Ill. t.* 125 but flowers pink not blue. *Fyson* 3049.

var. 2 **affinis,** *Herb. Wight Prop.* 1297 ! ; plant smaller than *var.* 1. Leaves $\frac{1}{2}$ to $\frac{3}{4}$ inch hairy ; stipular bristles short ; panicle 1 to 2 inches, forms flat patches a foot or more across in short grass ; very fetid ; stems often red on the upper side. *Wight Ic. t.* 1030.

var. 3 **deltoides,** *Herb. Wight Prop.* 1298 ! ; leaves $\frac{1}{2}$ to $\frac{3}{4}$ inch, nearly glabrous, as also the cymes.

Anotis longiflora *Hutchinson ; Kew Bulletin* 1916, *p.* 35. A weak fetid plant, straggling through others in the shade, with terminal bunches of white or pale pink, long-tubed, fragrant flowers.

Stem terete, almost glabrous, with internodes of 2 to 4 inches, green or reddish, but white and swollen under the nodes, and never rooting there. Stipular bristles long $\frac{1}{2}$ inch. Leaf-stalks $\frac{1}{4}$ inch : blades oblong ovate, up to 2 by $\frac{3}{4}$ inch, covered with short hairs on the upper side and on the nerves underneath : nerves eight to nine pairs, the more basal ones closer together than the distal, all curving forwards and reaching the margin. Panicle with fewer flowers than in A. Leschenaultiana not regularly trichotomous, bracts and bracteoles with hairy teeth. Calyx tube nearly glabrous, $\frac{1}{12}$ inch, the teeth more than twice as long, and half as wide, ciliate. Flowers very fragrant ; tube $\frac{1}{3}$ to $\frac{1}{2}$ inch, white or pale pink ; lobes four, $\frac{1}{8}$ inch, white ; ciliate. Stamens four erect, on short filaments at the mouth of the corolla. Stigma purple parted in the bud before the flower opens. Seed one only in each cell. **t. 222.**

In sholas among other shade-loving plants. Pulneys : above Kodaikanal, flowering September, at night, fading by 10 a.m.

Quite distinct from *A. Leschenaultiana*, though the leaves have a superficial resemblance.

Anotis Wightiana *Hook. f. ; F.B.I.* iii 75, XXII 16. A small weak herb with stem 2 to 8 inches, all green parts covered with soft hairs. Leaves ovate or elliptic, acute, sessile or nearly so. Flowers in small terminal cymes with a pair of leaves just below. Calyx tube $\frac{1}{12}$ inch, lobes ciliate. Corolla $\frac{1}{8}$ inch long and wide, three or four

lobed, usually white but also pink or blue. Fruit roundish, usually with two seeds, also with three or four, rugose when dry. t. 223.

Nilgiris: Coonoor, Pykara, Ootacamund. Damp places. Kodanad.

Gen. Dist. Nepal to Khasia, mountains of South India, Malaya, China.

Anotis monosperma *Hooker, Wight's Herb. Prop.* 1295 1 *!; F.B.I.* iii 75, XXII 17. A very delicate, shade-loving plant with slender stem and thin leaves and pale mauve flowers nearly sessile on the long capillary branches of a loose cymose inflorescence.

Stem and leaves pubescent. Leaf-stalk $\frac{1}{4}$ to 1 inch; blades ovate, 1 to 2 inches by $\frac{5}{8}$ to 1 inch, or occasionally much less, acute or acuminate, broadest near the base and then narrowed suddenly and cuspidately to the stalk. Inflorescence axillary; branches capillary and divergent. Flowers nearly sessile in twos and threes, in irregular corymbose cymes, white tinged with pink or mauve. Fruit $\frac{1}{12}$ inch, rather broader than long, broadest at the top and crowned by the small calyx teeth. Capsule slightly convex and compressed laterally with entire, not bi-lobed, crown; when nearly ripe almost golden yellow. Seed one or two, coarsely pitted. t. 224.

In sholas and shady places. Pulneys: on the plateau. (Pillar rocks, Glen Falls).

Wight's type sheet, No. 1295, has leaf-blades one-fourth to three-fourth inch, and appears to be a smaller plant altogether. Possibly the one described here is a shade form of it.

Anotis decipiens *Hook. f.; F.B.I.* iii 72, XXII 4; is reported from these levels. It appears to differ only in the fruit which is rounder than that of A. monosperma, and opens by a slit between the calyx teeth. I am however uncertain about the occurrence.

OPHIORRHIZA. F.B.I. 75 XXV.

Small shrubs with opposite entire leaves and white, pink or greenish tubular flowers arranged along one side only of the branches in terminal forking cymes, and distinguished from all other of our genera by the fruit, which is flat, much wider than long, and opens by a split along the long narrow top. Stipules soon falling.

Species about 50, mostly in tropical Asia.

KEY TO THE SPECIES.

c	Bracteoles very short	O. pykarensis.
	Bracteoles long, linear	*b*
b	Corolla ⅓ inch, glabrous	O. Brunonis.
	Corolla 1 inch, hairy	O. Roxburghiana.

Ophiorrhiza Brunonis *Wight and Arnott ; F.B.I* iii 79, XXV 10. Leaves 2 to 3 inches ovate-elliptic, acute or acuminate, narrowed to the slender 1-inch stalk. Terminal cymes of flowers rounded. Corolla tube ¼ inch, with narrow lobes. Capsule ¼ inch. **t. 225.**

Nilgiris : near Lovedale, flowering September to October.

Very common in sholas of medium density near Coonoor, flower May.

A hairy form, separated in *F.B.I.* as var. hirsutior, and in *G.F.M.P.* as a distinct species **O. hirsutella** *Wt.* has been found on the Kundahs (Mayuranathan) though commoner at lower levels.

Ophiorrhiza Roxburghiana *Wt. ; F.B.I.* iii 81, XXV 15. Leaves oblong, ovate or obovate, shortly acuminate narrowed at the base at the short stalk, glabrous on the upperside, puberous on the nerves of the lower. Bracteoles linear. Corolla tube 1 inch funnel-shaped yellow, hairy. Capsule hairy.

Pulneys : Kodaikanal shola, at 7,000 feet. Flower May.

Ophiorrhiza pykarensis *Gamble*. An erect slender undershrub. Leaves 1 to 1¼ inches with acute apex and cuneate and decurrent at the base, pale underneath, 7 to 8 veined.

Nilgiris : at Pykara *Gamble* [*G.F.M.P.*].

MUSSÆNDA. F.B.I. 75 XXIX.

Shrubs of the usual rubiaceous type, and distinguished among all ours by the large white or yellow leaf-like sepal against some flowers. Corolla valvate. Ovary two-celled. Fruit a many-seeded berry.

Species about 50, in tropical Africa, Asia and Polynesia.

Mussænda hirsutissima *Hutch.* (Mussænda frondosa *Linn.* ; *var.* hirsutissima) ; *F.B.I.* iii 89, XXIX 9. Very hairy all over. Leaves ovate acute, shortly stalked, 2 to 4 inches. Leaf-like sepal white. Corolla tube 1¼ to 1½, limb stellate, orange-brown, 1 inch across, with lighter very hairy mouth. **t. 226.**

Nilgiris and Pulneys. Abundant on the lower slopes up to 6,000 feet. Shevaroys : on plateau.

Gen. Dist. From Nepal to South India, and to Malaya.

Mussænda lutea with leaf-sepal yellow, is grown in Madras gardens.

CHOMELIA (*formerly included in* WEBERA).

F.B.I. 75 XLII.

Trees or shrubs with terminal corymbiform cymes of bisexual flowers ; corolla lobes twisted in bud ; filaments of stamens short and anthers long ; style stout, stigma long and thick ; fruit a two-celled berry with two or more seeds.

Species few, in tropical Asia.

Chomelia asiatica *O.Kze.* formerly Webera corymbosa *Willd* ; *F.B.I.* iii. 102, XLII 1. A shola shrub

or small tree, distinguished by its terminal cymose corymbs of white fragrant flowers with five waxy, spreading petals, slender anthers, and thick style ; and remarkable for the hard glossy leaves, furrowed by the deeply impressed main nerves.

Branches nearly round, with smooth reddish brown bark, not lenticelled, slightly swollen at the nodes : stipules forming a complete, short tube $\frac{1}{3}$ inch long above the insertion of the leaves. Leaf-stalk $\frac{1}{3}$ inch, stout, puberulous ; blade about 4 by 2 inches, larger or smaller, elliptic, bluntly acuminate, entire, hard, glabrous, very glossy, deeply furrowed ; nerves about ten pairs, impressed on the upper side, raised on the lower often (? always), with perforations at the axils ; veins inconspicuous. Corymbs terminal, regularly three-branched ; peduncle one inch, branches stout, pedicels $\frac{1}{30}$ inch, calyx tube $\frac{1}{8}$ inch, campanulate, lobes half as long triangular. Corolla tube not as long as the calyx ; petals spreading out flat from just inside it, $\frac{1}{4}$ by $\frac{1}{6}$ inch, ovate, waxy. Anthers slender, $\frac{1}{6}$ inch, nearly sessile in the mouth of the corolla. Style projecting about $\frac{1}{5}$ inch above, thickened upwards and ridged. Ovary two-celled, with two or more ovules in each cell. Fruit a small round berry, $\frac{1}{4}$ inch, surmounted by the very conspicuous calyx teeth (like a diminutive Guava fruit). Seeds few or many, angular with one side rounded. **t. 227.**

In sholas. Nilgiris : Ootacamund to Pykara, flowering May. Pulneys : Shembaganur.

Gen. Dist. Western Peninsula and Central Provinces.

RANDIA.

Flowers axillary. Corolla twisted in bud. Fruit a globose berry, many-seeded. A large tropical genus.

Randia dumetorum *Lamk.* Leaves about 2 by $1\frac{1}{4}$ inches elliptic, entire. Spines axillary, straight $\frac{3}{4}$ to 1 inch, stout. Flowers solitary in the axils, quite small. Fruit like a small guava, crowned by the calyx teeth.

Belongs to the plains but occurs on the plateau of the Shevaroys.

KNOXIA. F.B.I. 75 LXI.

Herbs with ovate or lanceolate many-veined leaves, bristly stipules, terminal corymbs of blue or purple flowers and in each cell of the two-celled ovary a single pendent ovule with its stalk swollen and spread out into a cap at the top. Calyx teeth four with one larger. Corolla lobes four, valvate in bud. Stamens four, longer or shorter. Style two-cleft at the stigmas, shorter or longer. Fruit of two one-seeded parts, more or less united, separating or not.

Species about 10 in India, Malaya and Australia.

Leaves about twice as long as broad, ovate-acute . K. mollis.
Leaves lanceolate-acuminate, three times as long as broad (probably occurs only at lower levels) . . K. corymbosa.
Leaves lanceolate, six times as long as broad . K. Wightiana.

Knoxia mollis *Wight and Arnott ; F.B.I.* iii 129, LXI 2. Stem 1 to 4 feet, four-angled, very or slightly pubescent. Leaf-stalks $\frac{1}{8}$ to $\frac{1}{4}$ inch : blade $1\frac{1}{4}$ to $2\frac{1}{2}$ inches by $\frac{1}{2}$ to $1\frac{1}{4}$ inches, ovate or elliptic ovate, acute, densely pubescent on the upper and nerves of the lower side : stipular bristles $\frac{1}{4}$ to $\frac{1}{2}$ inch. Corymbs 2 to 3 inches, pubescent. Calyx tube $\frac{1}{16}$ inch ; teeth triangular, shorter one often slightly larger. Corolla tube $\frac{1}{4}$ to $\frac{3}{8}$ inch : lobes $\frac{1}{8}$ inch. Fruit ellipsoid ; the two halves connate and attached to the central columella. **t. 228.**

Occurs in two fairly distinct forms—

* by roadsides, 1 to 2 feet, corymbs open.

** in damp soil on the sides of sholas, 3 to 4 feet, leaves and flowers larger in every way: corymbs close down on the top leaves.

Pulneys: on the downs common. Nilgiris.

Mrs. Evershed tells me that this plant is the food-plant of a velvety black Chærocarpa (Hawk-moth) caterpillar. The flowers have long or short stamens; *cf.* under OXALIS, *p.* 72.

Knoxia Wightiana *Wall., Cat.* 6184*!; F.B.I.* iii 129, XXI 4. Rootstock stout and woody. Stems slender, four-angled glabrous. Leaves narrow, lanceolate, obtuse or oblong, narrowed to the base, 2 to 3 by $\frac{1}{4}$ to $\frac{1}{2}$ inch, often folded along the midrib and recurved: stipular. Bristles often wanting. Flowering corymbs compact, 1 inch; in fruit open 2 to 4 inches. Fruit ellipsoid or globular, $\frac{1}{8}$ inch. **t. 229.**

Nilgiris: on the plateau below Ootacamund. Biccapatti. Pulneys: at lower levels.

Gen. Dist. South Indian hills.

Knoxia corymbosa *Willd.; F.B.I.* iii 128. Similar to the last, but stem and leaves hairy, stipular sheaths with several hairy bristles.

Pulneys: Shembaganur and below. Shevaroys: on the plateau.

These two species, I cannot help thinking, should be classed as varieties of one.

PLECTRONIA (*formerly* CANTHIUM). F.B.I. LXI.I.

Shrubs and trees, sometimes spiny, with entire opposite leaves, short triangular combined stipules, and small flowers in axillary fascicles or corymbose cymes. Corolla

white with a ring of reflexed hairs inside; lobes valvate. Stamens on the mouth of the corolla. Fruit globose or two-lobed, with one stone in each cell; embryo long, with short cotyledon and radicle pointing upwards.

Species about 70, in the tropics of the Old World.

KEY TO THE SPECIES.

Flowers in dense peduncled umbels; fruits $\frac{1}{4}$ inch; leaves thick . . . . P. umbellatum.
Flowers few; fruit $\frac{3}{4}$ inch; leaves thin . . P. neilgherrensis.

Plectronia neilgherrensis *Bedd.* Canthium neilgherrensis *Wt.*; *F.B.I.* iii 133, LXII 4 *var.* Chartacea *Gamble.* A small tree or shrub, not spiny. Leaves elliptic 3 to 4 by $1\frac{1}{2}$ to 2 inches, pubescent underneath; petioles short. Fascicles of flowers very shortly peduncled. Fruit one or two to a leaf-axil $\frac{3}{4}$ inch obovoid, showing the double stone, and crowned by the scarcely perceptible calyx. **t. 230.** Wight Ic. t. 1064.

Nilgiris: Kotagiri in Longwood shola, 6,500 feet. "Droog" under moderate shade 5,300 feet. Flowers early in the year.

Gen. Dist. Nilgiri and Pulney Hills.

Plectronia didyma *Kew. var.* **umbellatam** *Gamble*; Canthium umbellatum *Wight*; *F.B.I.* iii 132, LXII 3. A fair-sized tree. Leaves very coriaceous, 4 by 2 inches, on very short stalks, elliptic, shortly acuminate, shining on the upper side, perfectly glabrous. Flowers $\frac{1}{8}$ to $\frac{1}{6}$ inch in dense shortly peduncled cymose umbels. Pedicels about 1 inch. Fruits $\frac{1}{4}$ to $\frac{1}{3}$ inch, obovoid, with two stones, but not didymous, indense axillary masses.

Nilgiris, below Coonoor, Shevaroys: on the plateau.

Gen. Dist. Western Ghauts.

IXORA. F.B.I. 75 LXVI.

Shrubs or small trees characterized chiefly by the very slender corolla tubes ; petals twisted, anthers nearly sessile on the corolla mouth, style slender, stigma slender, fruit of two pyrenes each with one peltate seed.

Species about 100, in the tropics of Asia and Africa. One species *I. coccinea* is very common in gardens on the plains of South India.

Ixora Notoniana *Wallich ; F.B.I.* iii 139, LXVI 5. A small shola tree distinguished among all our trees by its very slender pink or red corolla tubes, $\frac{1}{2}$ by $\frac{1}{20}$ inch. The flowers are in hemispherical clusters massed into broadly rounded panicles, 6 inches across, pink and fragrant.

A small shola tree ; branches roughened by the scars of the fallen leaves and stipules ; bark light coloured. Stipules forming a complete sheath round the axis just above each pair of leaves with $\frac{1}{6}$ inch subulate points. Leaf-stalks stout $\frac{1}{2}$ inch ; blade 4 to 6 by 2 to $2\frac{1}{2}$ inches, entire, more or less elliptic, firm, quite glabrous and shiny dark green above ; midrib stout, veins ten to fifteen pairs, curving forwards near the margin. Panicles terminal ; branches opposite or in threes, well separated, often like the main axis, pink ; the branches again branched near their ends, forming very regular hemispherical cymes $1\frac{1}{2}$ inches wide ; the whole panicle 4 to 6 inches wide. Calyx tube $\frac{1}{30}$ inch, longer than the ovary ; teeth longer. Corolla tube $\frac{1}{2}$ by $\frac{1}{20}$ inch, petals $\frac{1}{8}$ inch, spreading or at length reflexed close against the tube. Anthers linear, $\frac{1}{16}$ inch, attached to the mouth. Style exserted $\frac{1}{10}$ inch, bifid. Fruit black nearly round, of two cells, $\frac{1}{3}$ by $\frac{1}{8}$ by $\frac{1}{4}$ inch, crowned by the small remains of the

calyx ; seeds two, hemispherical, attached by the middle to the axile placenta; endosperm curved round the outer margin of the seed, $\frac{1}{20}$ inch thick in the middle where lies the embryo ; cotyledons thin and flat, radicle comparatively long, pointing downwards. **t. 231**. *a.* anther ; *b.* bud ; *c.* opened flower ; *f.* fruit ; *s.* seed ; *e.* embryo ; f_2. two fruits in section.

In sholas. Nilgiris : not perhaps at the highest levels ; abundant at Coonoor ; Pykara, flowers May ; Kotagiri ; Biccapatti earlier. Pulneys : at lower levels. Not elsewhere.

PAVETTA. F.B.I. 75 LXVII.

Shrubs and small trees with terminal cymose corymbs of flowers. Similar to IXORA, but distinguished by large stipular bracts at the base of the lower branches of the inflorescence, stipules more united into a tube, style much longer and protruding from the corolla, and ovules on large placentas.

Species about 60 in the tropics of the Old World. *The name has an Indian origin, one species* (*P. indica*) *being common on the plains.*

Pavetta breviflora *DC. ; F.B.I.* iii 151, LXVII 5. A shola shrub, distinguished from all others of this order by the long, thickened, undivided style projecting $\frac{1}{2}$ inch beyond the corolla, by the rather long buds white with green tips, and by the broad stipules at the lower branches of the cymose corymbs.

Branches smooth, shining, light yellowish grey, conspicuously marked at the nodes by the scars of the stipules. Leaves elliptic, bluntly acuminate, narrowed to the short petiole, 3 to 5 by $1\frac{1}{4}$ to $1\frac{1}{2}$ inches, quite glabrous, entire shiny above : nerves about six pairs, very distinctly raised on the underside dotted with large glands.

Flowers in corymbs of perfect cymes, terminating short branches in the upper axils ; branches stout, the lower sheathed by $\frac{1}{4}$ inch broad, thin stipules : pedicels slender $\frac{1}{6}$ to $\frac{1}{4}$ inch. Calyx $\frac{1}{20}$ inch, with minute, triangular teeth, dark green, glabrous. Corolla tube $\frac{1}{2}$ to $\frac{3}{4}$ inch, white : lobes $\frac{1}{4}$ inch reflexed, in bud green on the outside, twisted. Anthers very slender, $\frac{1}{6}$ inch long, attached by short slender filaments to the top of the corolla tube. Style twice as long as the corolla tube, thickened at the end and greenish, undivided, persistent after the fall of the corolla. Ovary two-celled, with one ovule in each cell. Fruit black, $\frac{2}{5}$ inch across, containing one or two stones. Wight Ic. t. 1035. **t. 232.**

Under the shade of shola trees, as an undershrub : on both plateaus flowering summer, fruiting winter months.

STYLOCORYNE.

Shrubs similar in habit to Webera or Chomelia but the petals 5, imbricate, ovules one only in each cell, pendulous, i.e., with radicle upwards. Style hairy.

Stylocoryne lucens *Gamble ;* Webera lucens ; *Hook f.* in *F.B.I.* iii 106. A busy shrub. Leaves nearly sessile, elliptic, acute at both ends, glabrous, shining and drying black. Calyx teeth short. Flowers white $\frac{1}{2}$ inch. Fruit $\frac{1}{2}$ to $\frac{3}{4}$ inch ; two-seeded.

Nilgiris : Kundah sholas, above 7,000 feet [*G.F.M.P.*].

PSYCHOTRIA. F.B.I. 75 LXXV.

Shrubs or small trees with white flowers in terminal panicles and characterized by the short straight corolla tube, hairy at the throat, petals valvate in bud, ovary of two cells each with one wedge-shaped ovule erect from

the base, and fruit a drupe containing two plano-convex pyrenes each with one plano-convex thin-coated seed with hard endosperm and small basal embryo. Another characteristic is the presence of glandular hairs in the axils of the stipules. All our species grow under the shade of shola trees.

A large genus of 500 species all tropical or sub-tropical.

KEY TO THE SPECIES.

a { Branches of inflorescence whorled ; seeds not grooved, endosperm ruminate . . . . P. congesta.
Branches of inflorescence opposite . . . . b

b { Inflorescence long, two large bracts at the base ; seeds not grooved, endosperm ruminate . . . P. elongata.
Inflorescence short, flowers starry, no bracts at base ; seeds grooved on back, endosperm not ruminate . . P. bisulcata.

Psychotria congesta *Wight and Arnott ; F.B.I.* iii 162, LXXV 5. All parts glabrous. Bark smooth. Leaves 2 to 5 inches by a third as broad obovate or oblanceolate, broadest well beyond the middle, bluntly cuspidate or acute, and narrowing gradually to the $\frac{1}{4}$ to 1 inch stalk : nerves eight to ten pairs, very regular and strong. Cymes dense with short thick branches. Corolla tube very short. Fruit ellipsoid or roundish, black, crowned by the persistent, $\frac{1}{16}$ inch, calyx tube (like the English Black Currant). Seeds two or one only, each in its own parchment (like Coffee), plano-convex and wedge-shaped, not grooved on the inner side : endosperm hard, ruminate : radicle pointing downwards ; wood white, close-grained. **t. 233.**

Very common as a shrub in woods ; foliage usually very dark. Nilgiris : on the downs. Pulneys : Kodaikanal downs and below.

Gen. Dist. South Indian hills.

There appear to be two distinct forms. At high levels, e.g., Dodabetta 8,000 to 8,600 feet and on the Pulneys at 7,500 feet; the leaves are large and the fruit has only one round seed. At lower levels about 7,000 feet, the leaves are only 2 to 3 inches long and the fruit invariably has two plano-convex seeds.

* *var.* **astephana** with less crowded cymes and scarcely raised calyx limb to the fruit. Pulneys.

Psychotria elongata *Wight ; F.B.I.* iii 163, LXXV 10. Bark thin, leaves nearly elliptic, opposite, impressed on the upper side with 13 or so very regularly placed pairs of nerves nearly always with perforations at the axils, and small white flowered cymes in erect terminal spikes subtended at the base by two very large stipules which form a divided tube, $\frac{1}{2}$ inch long. Whole plant quite glabrous, branches smooth and shining. Stipules early caducous. Calyx small. Corolla tube $\frac{1}{8}$ inch, lobes shorter, spreading; throat hairy. Stamens erect, filaments white. Fruit $\frac{1}{6}$ to $\frac{1}{3}$ inch diameter, black, globose. Seeds one round or two flat on the inner face. Endosperm ruminate. Wood reddish white, close-grained. **t. 234.** Wight Ic. t. 1036.

Nilgiris at 5,000 feet in dark sholas on both the eastern and the western half. Also near Coonoor, 6,000 feet under light shade but appears not to fruit well there. Shevaroys: Green Hills.

Gen. Dist. Western Ghauts. 4,000 to 7,000 feet.

Psychotria bisulcata *Wight and Arnott ; Herb Wight* 1351 *! ; F.B.I.* iii 171, LXXV 36. A dark-leafed shrub with corky bark. Leaves nearly elliptic, acute at each end; veins about nine pairs, quite glabrous. Flowers starry—the corolla lobes oblong, longer than the tube, spreading, white tipped with green. Filaments of stamens very short, so that the anthers form a brown

circle above the white wool of the corolla throat. Stigmas opening before the anthers, then closing, and brown. Fruit about $\frac{1}{4}$ inch, black. Pyrenes in section with two grooves on the back (not inside), endosperm not ruminate. **t. 235.**

The starry flowers make it quite distinct from the other species. Nilgiris : Lamb's Rock Road, Coonoor in fairly dense shade, e.g., under Hydnocarpus but not in the densest part. Kodanad.

LASIANTHUS. F.B.I. 75 LXXIX.

Shrubs with small flowers, nearly sessile in the leaf-axils and characterized most prominently by the evil smell of the leaves or fruit.

Branches compressed at the nodes. Combined stipules broad ; veins of leaves starting mostly from below the centre of the midrib and curving forward to meet or die out in the margin near the apex and joined by innumerable and close-set horizontal simple or forked secondary veins or veinlets. Flowers small, in axillary clusters or cymes peduncled or not. Calyx short with four or five teeth. Corolla funnel-shaped, $\frac{1}{2}$ inch or less ; lobes valvate in bud, white, pubescent on the upper and inner side (whence the name from the Greek LASIOS soft and ANTHOS flower). Stamens on the corolla throat : anthers linear or oblong. Ovary of four to nine cells with one erect ovule in each. Fruit a small drupe with narrow stones.

Species about 80, nearly all in the tropics of Asia.

KEY TO THE SPECIES.

a { Cymes distinctly stalked ; sepals slender ; veinlets reticulate. Well-branched shrubs . . . . *b*
Cymes sessile ; veinlets straight, parallel. Usually with single stem and horizontal branches c

b { Leaves 2 to 3 inches narrow ovate ; sepals $\frac{1}{8}$ to $\frac{1}{4}$ inch ; flowers yellowish . . . . L. venulosus.
Leaves 3 to 4 inches by 2 to $2\frac{1}{2}$ inches, broadly oval, with short acumen ; sepals $\frac{1}{10}$ inch . . . L. capitulatus.

c { Young parts and veins below ciliate ; leaves oblong-lanceolate, 3 to 6 inches ; veins about 6 pairs : secondary veins straight, joined by a reticulation of veinlets. Single stemmed shrub. . . . . L. coffeoides.
Young parts hirsute with purplish hairs ; leaves oblong, lanceolate ; veins about 6 pairs; secondary veins $\frac{1}{6}$ to $\frac{1}{8}$ inch apart, straight and branched ; sepals $\frac{1}{8}$ inch. Very stout shrub. . . . . L. ciliatus.
All parts glabrous : leaves obovate, deltoid, acuminate ; veins about 4 pairs only, veinlets very close and fine. L. acuminatus.

Lasianthus venulosus *Wight, Herb. Prop. ; F.B.I.* iii 100, LXXIX 49. A well-branched shrub, common under the shade of trees with yellowish white flowers in nearly sessile cymes of three, and black fruits $\frac{1}{2}$ inch across—not at all fœtid except the last. Branches when as thick as the finger still smooth and green, marked by the irregular warty ring-scars of the stipules ; these only on the youngest parts, barely $\frac{1}{10}$ inch. Petioles $\frac{1}{5}$ inch, channelled above. Leaves drying black. Blade ovate rounded at the base, acute or with a short apex, quite glabrous on both sides ; veins about six on each side, strong below and above, curving forwards to meet at the apex, and joined by more or less horizontal secondary veins connected by a fine reticulation of veinlets, areoles between these white with minute glands. Petals yellowish-white recurved, very pubescent on the inner side. Young fruit green, four-angled with the calyx teeth persistent round a $\frac{1}{8}$-inch circular scar at the top ; when ripe black and shining, with four angular stones. **t. 236.** Wight Ic. 1032.

In sholas as part of the second grade of woody plants.

Nilgiris : in and near Ootacamund and all over the downs to Pykara. Pulneys : about Kodaikanal. The commonest of our species.

Gen. Dist. Apparently only on these hills.

Lasianthus capitulatus *Wt.* ; *F.B.I.* iii 191, LXXIX 50. Similar in habit to the last species but larger, the leaves broadly ovate with short point. Sepals shorter.

Nilgiris : on the eastern and western slopes.

My sheet from Kotagiri has rather long sepals. The species should perhaps be regarded as a more robust form of L. venulosus.

Lasianthus coffeoides *Fyson* ; LXXIX 50. A shrub with upright undivided stem, long horizontal branches and evil-smelling leaves all facing upwards—much in the habit of the cultivated coffee.

Stem single, erect. Branches slender, weak, adpressed, pubescent. Stipules triangular, $\frac{1}{6}$ inch. Leaves drying yellowish-brown; stalks $\frac{1}{4}$ inch, pubescent; blades bifarious, ovate elliptic acute, 4 to 5 by $1\frac{1}{2}$ inches, glabrous and shining above, pubescent on the nerves below ; veins six to nine on each side, the last arising on the midrib well beyond the middle joined by straightish veinlets, hardly distinguishable into secondary and tertiary ; surface not white between. Flowers three to four together, sessile on a very short peduncle ; bracts linear $\frac{1}{12}$ inch. Calyx tube and teeth each about $\frac{1}{16}$ inch or less. Corolla white, tube $\frac{1}{5}$ inch ; lobes $\frac{1}{6}$ inch, oblong, hairy within. Anthers almost sessile on the throat. Style slender ; sitgmas four, spreading, $\frac{1}{50}$ inch each. **t. 237.**

The coffee-like habit gives this and the next, among our plants, a very characteristic appearance.

Pulneys : in the sholas near Kodaikanal and on the downs. *Fyson* 1821, 1235, 1088.

Apparently only on these hills.

Lasianthus ciliatus *Wt. ; F.B.I.* iii 184, LXXIX 23. Similar in habit to the last which is perhaps a higher level form of it, but stouter and more hirsute. Young parts and flowers tending to purple.

Nilgiris : on the margins of the pleateau under fairly deep shade : below Kodanad ; common on Lamb's Rock Road under Hydnocarpus ; Sispara.

Lasianthus acuminatus *Wight pro parte ; F.B.I.* ii 85, LXXIX 27. Characterized by the leaves wedge-shaped at the base and drawn out into an acumen at the tip, with three to four pairs only of strong nerves.

Branches slender, sparingly pubescent or glabrous. Leaves not white beneath, drying a clear brown ; petioles $\frac{1}{5}$ inch pubescent or glabrous ; blades $3\frac{1}{2}$ to 4 by $1\frac{1}{4}$ to $1\frac{1}{2}$ inches, obovate or oblanceolate, acuminate, narrowed to the petiole, glabrous above and below except on the nerves. Veins three to four pairs, seldom starting from the midrib beyond the broadest part of the leaf, strongly raised below when dry ; joined by very close nearly straight secondary veins and veinlets. Flowers sub-sessile, pedicel $\frac{1}{16}$ inch. Calyx tube $\frac{1}{12}$ inch, teeth half as long. Corolla woolly within. Stamens $\frac{1}{4}$ inch.

Pulneys : near Kodaikanal.

This is, I believe, what Wight had most in his mind in writing the description of the species in the Calcutta Journal of Natural History vi. (1846), p. 511. On his type sheet at Kew there are two species, the other being my *L. coffeoides.*

SPERMACOCE. F.B.I. 75 LXXXVII.

Herbs with square branches, stipules connate into a broad tube with marginal bristles, and small flowers in axillary or terminal fascicles; and characterized further by the corolla lobes valvate in bud, and the fruit dividing into two one-seeded parts.

Species about 150 tropical and subtropical.

Spermacoce ocymoides *Burm.*; *F.B.I.* iii 200, LXXXVII 2. Very variable. Branches numerous, weak or prostrate, forming in dry places a dense tuft. Leaves close or distant according to situation, $\frac{1}{4}$ to $1\frac{1}{2}$ inches by $\frac{1}{6}$ to $\frac{1}{2}$ inch, more or less acute at both ends, subsessile or petioled. Corolla white, small, hairy at the throat, four lobed. Fruit surmounted by the four spreading sepals, and splitting into two parts which open along their inner faces. Seeds narrow ellipsoid. **t. 238.**

Pulneys: slopes of the Shembaganur valley, etc., 5,000 to 6,000 feet; Kukal. In grass.

Kukal, 7,000 feet. Nilgiris: Coonoor.

GALIUM *and* RUBIA.

Slender stemmed herbs, distinguished from all other of our plants by the stipules not being united in pairs but enlarged like leaves, and in some species even divided, so that at each node there are from four to eight 'leaves.' Corolla lobes valvate in bud. Fruit of two small coriaceous or fleshy indehiscent lobes.

Corolla lobes five, leaves heart-shaped stalked . . RUBIA.
Corolla lobes four, leaves narrow or nearly round . GALIUM.

RUBIA F.B.I. 75 LXXXIX.

Madder.

A genus allied to Galium (Goose-grass, Bed-straw, etc.), but with the petals five instead of four.

Species 5, Europe, Asia, Africa and South America (*Fr.* Garance, *Ger.* Röte).

Rubia cordifolia *Linn.* ; *F.B.I.* iii 202, LXXXIX I. Stems slender, four-angled, rough, weak and straggling up shrubs and small trees. Leaves four in a whorl, with unequal petioles varying from $\frac{1}{4}$ to 2 inches : blades cordate, usually 1 to 2 by $\frac{5}{8}$ to 1 inch, but sometimes quite small and often only one and a half times as long as broad, shining above, very scabrid; nerves three to seven, curving from base to apex or the margin near it, very strong. Cymes in small panicles axillary to leaf-like bracts on short axillary branches. Receptacle ovoid entire. No sepals. Corolla rotate, five-lobed. Fruit $\frac{1}{8}$ to $\frac{1}{16}$ inch, globose or two-lobed. **t. 239.**

In thickets or climbing up small trees. Common on both Nilgiri and Pulney plateaus. Shevaroys.

Gen. Dist. In temperate climates of India, tropical Africa and Asia, and Japan.

GALIUM. F.B.I. 75 XC.

Bed-straw, *Goose-grass*, *etc.*

Distinguished from RUBIA by the petals being always four not five.

Species over 200. In Europe several (*Ger.* Klebekraut, Bettstroh ; *Fr.* Gratteron, Caille-lait).

Leaves four, broad. Fruit with hooked spines. G. javanicum.
Leaves six or eight, narrow. Fruit smooth. G. asperifolium.

Galium javanicum *DC.*, formerly G. rotundifolium ; *F.B.I.* iii 204, XC I. Perennial, glabrous or pubsecent ; stems weak, trailing. Leaves $\frac{1}{6}$ to $\frac{1}{3}$ inch broadly ovate, mucronate, strongly three-veined. Flowers yellow in bunches at the ends of short branches. Fruit with hooked spines. **t. 240.**

Nilgiris : on the downs near Ootacamund especially on ground cleared of Cinchona. Pulneys : below Kodaikanal.

Galium asperifolium *Wallich ; F.B.I. included* in Galium mollugo *Linn.*, iii 207, XC 12, Indian Bed-straw. Stem slender, slightly rough on the four angles. Leaves at a node six, obovate apiculate, one-nerved, with a few scattered hairs. Flowering branches copiously branched, their leaves smaller and at the final divisions $\frac{1}{6}$ or $\frac{1}{8}$ inch only and reduced to two or three at the node. Flowers minute, petals $\frac{1}{16}$ inch, ovate. Fruit nearly glabrous. Climbing on bushes and shrubs. **t. 241.**

Pulneys : on the downs above Kodaikanal. Nilgiris : on the plateau.

Gen. Dist. Mountains of India, Himalayas, etc.

VALERIANACEÆ.

VALERIANA. F.B.I. 76 III.

Valerian.

Herbs with simple or sparingly branched stem ; opposite, pinnate or occasionally simple, leaves ; and numerous small pink or white flowers in much-branched terminal, corymbose panicles. Ovary inferior with no calyx-teeth ; corolla tube slender, usually swollen on one side near the base, five-lobed ; stamens three only ; ovary three-celled, ripening into a one-seeded dry fruit crowned by a pappus of a few feathery hairs.

Species about 150, in moist temperate or cool regions ; mostly in Europe, America and Asia ; a few in Africa, but none in Austraiia or New Zealand. (*Ger.* Baldrian).

a { Leaves simple or with one or two leaflets. V. Leschenaultii
a { Leaves pinnate . . . . *b*

b { Leaflets five, broad . . . . V. Arnottiana.
Leaflets seven, end leaflet broad, lateral narrow; fruit hairy . . . . V. Hookeriana.
Leaflets many, all narrow; fruit glabrous. V. Beddomei.

Valeriana Arnottiana *Wt.;* formerly V. Hardwickii *Wall.*, var. *Cat.* 433 *! ; F.B.I.* 8ii 213. III 9. Five-leaf Valerian. Stem $1\frac{1}{2}$ to 3 feet, pubescent at the nodes, only slightly so elsewhere. Radical leaves disappearing before flowering time: of stem leaves the leaflets usually five, occasionally more, ovate; the terminal largest and not much longer than broad, the lateral slightly narrower but not much so. Corymbs in early flower 1 to 3 inches across; but in fruit much larger and more open, becoming a panicle a foot high and wide, the branches repeatedly forking. Fruit $\frac{1}{8}$ by $\frac{1}{16}$ inch cylindrical ovoid, hairy. **t. 242.** Wight Ic. tt. 1045-6.

In woods. Nilgiris: Lovedale, Coonoor. Pulneys: on the edge of the plateau, not common. Flowers June to September.

Gen. Dist. Mountains of South India.

Formerly considered a variety of V. Hardwickii *Wall.* a plant of the temperate Himalaya, but now separated as a distinct species. In Java it becomes V. javanica *Bl.*

Valeriana Hookeriana *Wight and Arnott ; F.B.I.* iii 214, III 11. Stem pubescent, bearded at the nodes. All lower leaves pinnate, lowest long-stalked; leaflets seven or more; end leaflet ovate or obovate, sinuate or coarsely and bluntly toothed, $\frac{1}{2}$ to 2 inches; lateral leaflets lanceolate, $\frac{1}{2}$ to 1 inch, of the lowest leaves toothed, of the upper entire and narrower (oblong to linear). Corymbs in fruit lax, 3 to 4 inches across. Fruit ridged and hairy. *b.* ovary. **t. 243.** Wight Ill. t. 129.

Pulneys : on the downs, flowers March to July, very abundant. Not elsewhere.

Very close to V. Moonii *Arn.*, of Ceylon, which however has fewer and much larger leaflets.

Valeriana Leschenaultii *DC.*, *var.* **Brunoniana**; *F.B.I.* iii 214, III 12. Stem glabrous or nearly so. Leaves simple or with perhaps one or two degenerate leaflets or lobes at the base of the blade or on the 2 to 6 inches leaf-stalk ; blade lanceolate, to ovate or cordate, or in the upper parts oblanceolate, entire or nearly so. Fruit glabrous. **t. 244.** Wight Ic. 1043.

Nilgiris : on the downs, Ootacamund to Pykara and Coonoor ; flowers June to September only here. I am told that in some situations the leaves are large, " like an Arum " and fleshy.

Valeriana Beddomei *C. B. Clarke* ; *F.B.I.* ii 214, III 13. Lowest leaves pinnate. Leaflets numerous oblong, terminal one not much larger. Fruit glabrous, in fairly compact not very loose corymbs.

Pulneys : on road to Poombari and above.

On the higher downs glabrous and hairy forms occur side by side.

DIPSACACEÆ.

Teasel and Scabious.

Herbs with opposite leaves, and flowers (with inferior ovaries) small and usually aggregated into heads with bracts below, much as in COMPOSITÆ ; but the stamens free of each other (never united by their anthers) and the ovule or seed hanging from the top of the ovary not erect and inverted.

Species about 120, chiefly in the Mediterranean region, western Asia, South Africa, Japan and Ceylon. None in America, Polynesia or Australia.

In western Europe are two genera—DIPSACUS, Teasel, *Ger.* Kardendistel, *Fr.* Cardere; and SCABIOSA, Devils Bit, etc., *Ger.* Storbuse, *Fr.* Scabieuse.

DIPSACUS. F.B.I. 77 III.

Teasel.

Flowers in dense, stalked heads opening along a ring half way between centre and circumference (in COMPOSITÆ always from the circumference inwards): bracts between the flowers well developed: calyx-limb or top of ovary hairy but not bristly (distinction from SCABIOSA); ovary four-angled; corolla four-lobed, blue purple white or yellow; stamens four. All European and most Asiatic species with prickly stems and spiny involucral bracts, some Indian species (as ours) not so.

Species 86 in Europe, Asia and Africa, especially round the Mediterranean.

Dipsacus Leschenaultii *Coult.; F.B.I.* iii 215, III 5. A large herb with stout rootstock. Stem annual, 4 feet or higher, hollow, white or greenish, leafy from the base but not near the flowers. Lowest leaves very large, to 2 feet long; upper smaller but otherwise similar, clasping the stem and even meeting round it to form cups; lower pinnate or deeply pinnatifid, the terminal leaflet much the largest and decurrent as also most of the others; lateral leaflets or segments obliquely obovate or oblong; all coarsely toothed, ciliate, hirsute or almost glabrous. Flowerheads 2 by $1\frac{1}{4}$ inches long, peduncled, in loose cymes from the axils of linear bracts. Involucral bracts ovate-lanceolate, hairy; floral strongly mucronate and covered with hairs from tubercled bases. Flowers white or yellowish; tube shaggy at the base with reflexed

hairs ; lobes oblong, the two lower larger. Stamens four, well exserted ; filaments white, anthers purple. Style short at first, then exserted, flattened at the stigma. Fruiting head almost spherical, bristling with the long points of the stiff floral bracts : the involucral bracts depressed. **t. 245.** Wight Ill. ii. t. 130.

On the open downs above Kodaikanal. Flowers from June to September. Nilgiris. Not elsewhere.

The absence of prickles makes this plant, at first sight, appear much more like the English Scabious than Teasel.

COMPOSITÆ.

In this family the flowers are individually small, but massed into usually flat heads. The head is surrounded and enclosed in bud by an *involucre* or covering of *bracts*, which when the head is open forms a cylindrical tube, or a hemispherical cup, surrounding the flowers at least at their base. The shape and character of these *involucral bracts* are of some importance.

They may be in several rows and overlap each other, or be only a few in one circle with perhaps a few shorter outside (SENECIO Ragwort, TARAXACUM Dandelion). They may be long and narrow, or short and broad, acute or obtuse ; they may be altogether green, or have a papery margin at the end (CHRYSANTHEMUM, ARTEMESIA) or be altogether papery and glistening (ANAPHALIS, GNAPHALIUM) Everlastings or be spiny (CNICUS Thistle). The individual flowers being not quite complete are usually termed *florets*, and the more or less flat expansion of the stalk on which they are set, and which is backed and edged by the involucre, is termed the *receptacle*. In Sunflower and its allies and in some others there are scales on the receptacle between the florets.

The ovary is inferior, the corolla being above it, and there are no sepals, though often hairs or scales develop in their places (*pappus*). The corolla is monopetalous and is

either *tubular*, slightly enlarged above the middle and ending in five (or four) small lobes ; or extended to one side in the form of a strap or a tongue, and hence called *ligulate*. At the end of this flat tongue-shaped part there are usually three or five teeth, and there may be in addition a tooth at the bottom end where it joins the basal tubular portion. The nature and arrangement of the florets in the head are of very great importance.

In some the florets are all tubular and similar (VERNONIA, EUPATORIUM Hemp Agrimony, CNICUS Thistle) ; in some though all are tubular, the outer have no stamens (DICHROCEPHALA) ; in others most are tubular, but there is a circle at the outside of ligulate ones called *rays* (ASTER, HELIANTHUS Sunflower, SENECIO Ragwort) ; in others again all the florets are ligulate (TARAXACUM Dandelion, CREPIS Hawksbeard, SONCHUS Sow Thistle).

There are five stamens, with separate filaments attached to the corolla tube, and rather long narrow anthers connected to each other by the edges and forming a brown cylindrical box round the style. In all cases, except ADENOSTEMMA, each anther has at the top a small triangular flap, and these together close the top of the box and so protect the pollen which is shed inside out of the anthers ; but in some genera the bases of the anther lobes are *rounded*, in others produced downwards in slender *tails*. This last distinction is of considerable importance : it is used for instance to distinguish the VERNONIA tribe from the EUPATORIUM tribe. The ovary has a single chamber with one ovule and a single style divided at the top into two stigmatic branches.

These branches open out only after the style has pushed its way upwards between the anthers (pushing up pollen as it does so) ; and since all the florets do not come to maturity together, but the outermost first and the most central last, one

can usually find styles in all stages in one head. The stigmatic branches vary considerably in shape, being long and pointed (*subulate*) or flattened on one side, or thick and cut off square (*truncate*) or they end in a conical thickening.

The fruit is dry and indehiscent, and termed an *achene.* In some cases it has a tuft or circle of hairs (*pappus*) or scales at the top, but in others it is quite without them (Chrysanthemum, Sunflower). It contains one seed with oily endosperm attached to the base of the ovary.

The family is a very large one of about 10,000 species or one-tenth of all the flowering plants of the world, and is found in all regions and especially on mountains. The method of cross-pollination is very good (see below); and where there is a pappus to the fruit which allows it to be carried great distances by wind, a species is able to spread rapidly on new ground. Curiously enough, however, we find as a matter of fact that most of the species are very local.

The *tribes* or sections of the family represented here are—

A. Florets all tubular and similar.

(i) Florets blue, mauve or white, never yellow: involucral bracts green.

I. **VERNONIEÆ.** Anthers cleft at the base (cells tailed): stylar arms subulate: leaves usually alternate.

Pappus short: involucral bracts leaf-like . CENTRATHERUM.
Pappus long: involucral bracts narrow . . . VERNONIA.

II. **EUPATORIEÆ.** Anther cells not tailed: stylar arms obtuse pappillate. Leaves opposite or alternate.

Pappus of flat scales . . . . AGERATUM.
Pappus of club-shaped scales: sticky herb . ADENOSTEMMA.
Pappus of slender hairs. . . . . EUPATORIUM.

(ii) Florets mostly purple: involucral bracts often spiny.

IX. **CYNAROIDEÆ.** Anther cells tailed: stylar arms short: involucral bracts scarious or spiny: leaves alternate, often spiny.

Achenes with feathery pappus hairs . . . . . . CNICUS.

B. Outer florets without stamens ; often but not always ligulate.

(i) Involucral bracts in several rows.

(*a*) Receptacle naked.

III. **ASTEROIDEÆ.** Stylar arms flattened and ending in a conical thickening ; anthers not tailed : disc florets yellow. Rays usually yellow, but also white or purple.

* Heads not rayed, outer florets slender.

Heads spherical, purplish : receptacle tall with flat top : no pappus . . . . DICHROCEPHALA.

Heads cylindrical, golden ; receptacle flat : pappus long . . CONYZA.

** Heads rayed.

No pappus ; achenes viscid . . . . MYRIACTIS.

Pappus copious . . . . ERIGERON.

VI. **ANTHEMOIDEÆ.** Involucral bracts scarious or with scarious tips : anther cells not tailed : stylar arms truncate : receptacle naked (or occasionally with scales).

Heads small roundish, not rayed.

Tall plant, heads numerous . . . . . ARTEMESIA

Small herb, heads few, green . . . . COTULA

IV. **INULOIDEÆ.** Anther cells sagittate (tailed) or not : stylar arms linear, or of sterile florets not separating : pappus copious. All florets in our genera tubular, outer very slender.

* Bracts green, narrow, mostly strongly scented herbs.

Anther cells tailed . . . . BLUMEA.

Anther cells not tailed : stem winged . . . . LAGGERA.

** Bracts green, outer leafy . . . . CARPESIUM.

*** Bracts scarious.

Central florets with stamen and undivided style (sterile) : bracts white or pink . . . . ANAPHALIS.

Many of disc florets fertile : bracts yellow . GNAPHALIUM

All or nearly all disc florets fertile : bracts yellow. . . . HELICHRYSUM.

(*b*) Receptacle with scales between the florets

V. **HELIANTHOIDEÆ.** Heads usually rayed : anther cells not tailed : stylar arms truncate : achenes naked or with scales (but no pappus) : receptacle with scales between the florets : leaves in our genera opposite.

* Disc florets sterile with undivided styles . . . MOONIA.

** All florets fertile.

Five outer involucral bracts long, sticky ; heads globular, rays small . . . . SEIGESBECKIA.

Heads flat : rays conspicuous : achenes with two to four barbed bristles . . . . BIDENS.

Heads conical, without rays. No pappus. . SPILANTHES.

(ii) Involucral bracts in one row all same length or a few outer shorter.

VII. **SENECIONIDEÆ.** Involucral bracts in one row, all the same length or a few shorter outside : pappus of fine hairs : anther cells obtuse or with short points, not tailed : rays usually yellow : leaves alternate.

* Heads not rayed.

Bracts all one length : florets all purple . . . . . EMILIA.

A row outside of shorter bracts—

Stylar branches long and hairy . . . . GYNURA.

Stylar branches ovate at tips : fleshy herbs . . . NOTONIA.

** Head rayed or not, stylar branches truncate . . SENECIO.

C. All florets ligulate.

XI. **CICHORIACEÆ.** All florets ligulate with five-toothed tip : anther bases sagittate but not tailed : stylar arms slender : leaves never opposite. Usually milky herbs, with yellow flowers.

* Branched leafy herbs with heads in open corymbs : inner bracts of involucre thickened : achenes narrowed at each end.

Pappus hairs simple . . . . PICRIS.

Pappus hairs feathery . . . . CREPIS.

** Branched herbs : involucre dilated at the base : achenes narrowed below and above.

Achenes compressed, beaked . . . . . . LACTUCA.

Achenes not beaked. . . . . SONCHUS.

*** Heads solitary on leafless stems.

Pappus hairs simple . . . . TARAXACUM.

Pappus hairs feathery . . . . . . HYPOCHÆRIS.

KEY TO THE GENERA.

a	Florets all tubular: heads not rayed	b
	Inner florets tubular; outer strap-shaped forming rays (Sunflower, etc.)	m
	All florets strap-shaped (Dandelion, etc.)	s

Florets all tubular.

b	Florets purple, blue or white, never yellow	c
	Florets yellow	f
	Florets pale. Small herb with much divided leaves	*p.* 341. COTULA.
c	Outer involucral bracts very broad, almost leafy: underside of leaves white between green veins	*p.* 306. CENTRATHERUM.
	Involucral bracts narrow, in one or more series	d
	Heads almost spherical, outer florets slender: white, no pappus	*p.* 317. DICHROCEPHALA.
d	Anthers cleft at the base (tailed): leaves alternate	h
	Anthers not cleft: leaves opposite (*Eupatorieæ*)	e
	Do. leaves alternate narrow (*Erigeron*).	
e	*Eupatorieæ.*	
	Flrs. mauve: achenes with five scales.	*p.* 315. AGERATUM.
	Flowers white: achenes with scabrid hairs: young parts sticky	*p.* 316. EUPATORIUM.
	Sticky herb: anthers without the usual flap at the top: achenes five-ribbed, sticky: pappus of three to five short stiff hairs	*p.* 314. ADENOSTEMMA.
f	Heads globular $\frac{1}{6}$ to $\frac{1}{4}$ inch; outer florets slender: no pappus	*p.* 317. DICHROCEPHALA.
	Heads cylindrical or flat	g
	Heads conical, no pappus	*p.* 338. SPILANTHES.
g	Involucre green	i
	Involucre glistening, yellow, white or pink	*pp.* 326-3 ANAPHALIS, GNAPHALIUM or HELICHRYSUM.
h	Leaves entire or toothed, bracts in several rows	*p.* 308. VERNONIA.
	Leaves pinnatfid, lyrate, or stem clasping: heads broadest at the base, bracts in one series only	*p.* 343. EMILIA.
	Leaves irregularly toothed: woolly or strongly scented herbs	*p.* 323. BLUMEA.

i Outer involucral bracts leafy : achenes sticky : heads ½ inch. . . . . *p.* 334. GNAPHALIUM.
Outer involucral bracts acute and spreading : stem winged but not spiny . . . . *p.* 325. LAGGERA.
Whole plant spiny, pappus feathery. *p.* 352. CNICUS.
Bracts all narrow, green : achenes with pappus . . *k*
Bracts rounded with scarious margin : no pappus . *l*

k Heads ⅛ inch, numerous ; involucral bracts narrow, green or purple . . . . *p.* 321. CONYZA.
Heads ¼ inch, bracts several, woolly, or scented herbs . *p.* 323. BLUMEA.
Heads ½ inch ; bracts in one row, glabrous . . . . *pp.* 342-344 GYNURA or NOTONIA.

l Tall herb ; heads small . . . . *p.* 341. ARTEMESIA.
Low herb of 2 to 4 inches ; leaves much divided . . . *p.* 341. COTULA.

Heads rayed.

m Leaves opposite : receptacle with scales between the florets . . . . *n*
Leaves alternate : no scales on the receptacle . . . . *q*

n Leaves simple . . . . *o*
Leaves pinnate or bi-pinnate . . . . *p*

o Tall herb : heads with four or five ½-inch narrow sticky bracts below . . . . *p.* 338. SIEGESBECKIA.
Small, herb : achenes with feathery scales . . . . . . *p.* 340. GALINSOGA.

p Achenes surmounted by two or three *barbed* spines : rays yellow. . . . . *p.* 339. BIDENS.
Achenes without spines or pappus . . . . *p.* 337. MOONIA.

q Rays yellow : bracts in one row or with a few shorter outside . . . . *p.* 345. SENECIO.
Rays white, mauve or pink : bracts narrow in several rows . . . . *r*

r Achenes without pappus, viscid . . *p.* 318. MYRIACTIS.
Achenes with copious pappus. . . *p.* 319. ERIGERON.

Florets all ligulate (Cichoriaceæ).

s { Bracts eight to twelve, scabrid, with a few shorter outside. *p.* 352. PICRIS.
Bracts all green, glabrous : herbs with milky juice . . *t*

t { Achenes flattened : pappus united at the base and falling together. . . . . *p.* 357. SONCHUS.
Achenes not flattened, but narrowed below the top . . *p.* 353. CREPIS.
Outer achenes at least prolonged into a slender beak which bears the pappus . . . . *u*

u { Heads in racemes : beak of achene ending in a small disc bearing the simple pappus hairs. *p.* 356. LACTUCA.
Heads solitary on scapes . . . . *v*

v { Scape thick hollow ; never branched : outer bracts pendulous . . . . *p.* 356. TARAXACUM.
Scape slender ; inner achenes not beaked . . . . . . *p.* 355. HYPOCHÆRIS.

CENTRATHERUM. F.B.I. 78 I.

Herbs with alternate stalked toothed leaves, all the florets of a head tubular and similar, purple or white : ribbed achenes, and short scabrid, quickly falling pappus (distinction from VERNONIA).

Species about 10 mostly India, Malaya and a few also in America and Australia.

Centratherum reticulatum *Benth. ; Wight Herb. Prop.* 1391 *! ; F.B.I.* iii 227, II I. Distinguished from all our COMPOSITÆ except CARPESIUM by the broad almost leafy involucral bracts, five of which are sufficient to surround the base of the head ; and by the leaves which have the veins deeply impressed on the upper side, and very conspicuous on the lower, which is coated beneath with white hairs between them.

Perennial herb with yellowish rhizome. Stem branched or not, terete, usually dark purple in colour and

scabrid with short hard whitish hairs on red bases. Leaves sub-sessile ovate 2 by $\frac{3}{4}$ inch broadest near the rounded base, erect with the margin slightly recurved. Heads terminal, solitary : involucre hemispheric : bracts many seriate, the outer like small leaves, the inner progressively narrower with distinct mucro, the innermost scarious narrow-oblong. Florets slender, $\frac{1}{2}$ inch spreading ; lobes $\frac{1}{8}$ inch by $\frac{1}{30}$ inch, spreading. Anthers exserted, dark. Style exserted ; arms subulate. Achenes white $\frac{1}{8}$ inch, obscurely ten-ribbed : pappus brown or yellowish, $\frac{1}{6}$ inch, fugacious. **t. 246.**

The spreading florets remind one of the Knapweed. After the fruits have dispersed the empty involucres remain some considerable time, the outer scales reflexed and chocolate brown in colour, the inner erect.

In the grass of the open downs, abundant in places. Flowers July to October. Pulneys : very common above Kodaikanal, Nilgiris and Anamalais. Not elsewhere.

Centratherum Rangacharii *Gamble ; Kew Bull.* 1920, *p.* 338. An annual differing from the last species by its much smaller almost amplexicaul leaves on the underside white all over (not between a green net-work of veins) and smaller ($\frac{1}{2}$ inch) flower heads.

Nilgiris : near Coonoor (P. V. Mayuranathan). Previously recorded only from Tinnevelly.

Centratherum phyllolænum *Hook f. ; F.B.I.* i 228. Leaves 3 to 4 inches elliptic acute at both ends, coarsely serrate, white below, glabrous and not reticulate above. Heads $\frac{1}{2}$ inch, outer bracts narrow. Pappus reddish (but not always).

Nilgiris : near Coonoor (P. V. Mayuranathan). Belongs to low levels to 3,000 feet [*G.F.M.P.*].

VERNONIA. F.B.I. 78 V.

Herbs, shrubs or even trees with alternate leaves and cymose panicles of flower-heads, characterized by the many rows of involucral bracts, narrow or broad but not leafy ; the purple florets, all tubular and equal ; a persistent pappus to the achene, which latter has often a circle of short scales round the flat top outside the pappus, and anthers cleft at the base.

Species about 400. Mostly in America and chiefly in the tropics. Not in Europe.

Known in America and the colonies as Ironweed ; *Fr.* Vernonie, *Ger.* Bitterolse.

KEY TO THE SPECIES.

a	Tree, with purplish heads, 1-flowered, and thick leaves—	
	On Nilgiris, etc.	1. V. Monosis.
	On Shevaroys	2. V. shevaroyensis.
	Shrubs	*b*
	Herb, heads very numerous, bracts narrow.	V. conyzoides.
b	Bracts long-pointed ; heads ½ inch.	6. V. peninsularis.
	Lower bracts with reflexed point, pappus reddish.	7. V. saligna.
	All bracts blunt or short pointed.	.
c	Leaves glabrous, sharply toothed, pappus reddish.	3. V. pectiniformis.
	Leaves pubescent below, distantly serrate pappus white or cream	*d*
	Leaves white below, minutely serrate, pappus white, achenes	5. V. Fysonii.
	Leaves yellowish below, with arched back, achenes mostly.	8. V. Bourneana.
	Ls. tomentose below, oblanceolate, flat.	V. Bourdillonii.
d	Leaves ⅓ inch, only broad-heads few.	V. Ramaswamii.
	Ls. 2 to 3 by 1 to 2 inches, heads many.	4. V. pulneyensis.

1. **Vernonia Monosis** *Benth.; Herb. Wight Prop.* 1376 ! ; *F.B.I. as var.* Wightiana *of* V. arborea *Ham.* 3 ; iii 239,

V. 37.* A tree, conspicuous in the Nilgiri sholas of April and May as a huge white cone or ovoid crown of pappus and pale purple flowers with the scent of Heliotrope.

Tree up to 40 feet, with trunk 18 inches thick, but often smaller; youngest parts, underside of leaves and inflorescence densely tomentose. Leaf-stalks $\frac{1}{3}$ to $\frac{3}{4}$ inch, broadened at the base: blade elliptic entire, when dry with the smell of fresh hay (not cumurin), rounded and often oblique at the base, with about nine pairs of main veins connected by fairly straight secondary veins which enclose a net-work of veinlets. Flower-heads almost umbelled, the umbles again compounded into rounded masses at the ends of the branches forming leafy panicles 5 to 6 inches high and 4 to 5 inches wide, terminating the year's shoots. Involucre tubular, $\frac{1}{4}$ by $\frac{1}{16}$ inch, bracts many in four or five series; all but the innermost covered except on the margins with white tomentum; innermost thin, glabrous. Flower one only, mauve-coloured, nearly as long again as the involucre. Style exserted well above the perianth. Achene cylindrical, $\frac{1}{16}$ by $\frac{1}{20}$ inch, with glands between the very faint ten-ribs, white; pappus hairs all equal, twice as long, dirty white. **t. 247.** Wight Ic. t. 1085.

The leaves are the largest of all our trees except those of Meliosma Wightii and the leaflets of some Schefflera species.

In sholas. Nilgiris: up to at least 7,000 feet, especially common on the borders of our area; Pykara and below (a very fine specimen 35 to 40 feet high with trunk 18 inches near the short cut to Glen Morgan estate on the Waterfall road); Kotagiri: flowering early in May.

V. arborea *Ham.*, with which it is included in the F.B.I., is a Nepal plant with nearly or quite glabrous leaves and broader heads of six flowers The spreading pappus of the six achenes gives to the fruiting involucre a very different appearance from the close brush of one-flowered heads of our plant.

2. **Vernonia shevaroyensis** *Gamble ; Kew Bull.* 1920, *p.* 341. Small tree. Leaves oblanceolate, glabrous above, scabrid pubescent below, 6 to 10 inches long, main veins about 10 to 12 pairs, $\frac{1}{2}$ inch apart on midrib, veinlets irregularly reticulate between them. Ribs of achenes not prominent.

Shevaroys and Carnatic [*G.F.M.P.*].

3. **Vernonia pectiniformis** *Wight; Herb. Prop.* 1379 *!; F.B.I.* as of *DC.*, iii 239, V 36. A shrubby plant with broad finely serrate leaves and wide corymbs of flower-heads, distinguished among our species by the smooth, blunt, not narrow, bracts and rather long peduncles.

Stem terete, striate, pubescent or glabrous. Leaves ovate acute, very closely serrate, narrowed abruptly to the $\frac{1}{2}$-inch stalk : nerves many, $\frac{1}{8}$ inch apart, conspicuously parallel. Corymbs 3 to 5 inches, by forking of the stem and upper branches ; bracts at the forkings very small or absent ; ultimate peduncles $\frac{1}{3}$ to $\frac{1}{2}$ inch. Heads as long. Involucral bracts many-seriate, imbricate, lengthening evenly from the lower and outermost to the inner. Corolla $\frac{1}{3}$ inch, its tube $\frac{1}{6}$ inch. Achenes ten-ribbed, densely glandular but not hairy. Pappus $\frac{1}{2}$ inch. **t. 248.** Wight Ic. t. 1077 ; Sp. Nilg. t. 103.

Nilgiris : near Ootacamund, etc., common. Towards south-west (beyond Avalanche) is a stouter and more hairy form. Flowers from April onwards. Also Ceylon.

4. **Vernonia pulneyensis** *Gamble ; Kew Bull.* 1920, *p.* 341. A shrub not much branched with scattered almost cottony hairs which are thicker on the branches of the inflorescence and lower bracts. Leaves elliptic, acute at both ends, 4 by 2 inches, with bristle teeth $\frac{1}{6}$ to $\frac{1}{5}$ inch apart. Heads $\frac{1}{2}$ to $\frac{3}{4}$ inch wide, in terminal lower corymbs

Involucral bracts imbricate, or all spine tipped. Achenes $\frac{1}{8}$ to $\frac{1}{6}$ inch, ten-ribbed, glabrous. Pappus twice as long, dirty white. **t. 249.**

Pulneys: Shembaganur hill-side and Pambar R. near Kodai. Flower March and April. *Fyson* 4130, 4057.

Apparently belongs to lower levels. I have collected it also, but nearly glabrous, near Jog Fall in north-west Mysore.

5. **Vernonia Fysoni** *Calder; Rec. Bot. Surv. Ind. VI* 343 *& t. X.* A weak-stemmed straggling or climbing shrub. Stem and branches terete whitish, slender. Leaf-stalk $\frac{1}{2}$ inch. Leaves elliptic-lanceolate, acute, dark green on the upper surface, densely covered on the under with white tomentum, as on the branches and petioles: margins finely serrate, the teeth about $\frac{1}{16}$ inch apart, often curled down and liable therefore to be overlooked. Panicle terminal, its branches repeatedly forked, not spreading but sub-erect. Heads small, twice as long, $\frac{1}{5}$ inch, as broad, egg-shaped. Bracts with purple tips. Flowers pale purple. Achene with ten shallow ribs, minutely scabrid; pappus projecting $\frac{1}{5}$ inch beyond the involucre. **t. 250.**

Pulneys: at 7,000 feet in light sholas near Kodaikanal.

6. **Vernonia peninsularis** *Clarke; F.B.I.* iii 233, V 15. Distinguished from our other species by the long slender points to the involucral bracts.

Stem simple or branched, ribbed, covered with short or long hairs, sometimes almost shaggy, flexible. Leaves 2 to 4 by $1\frac{1}{2}$ to $2\frac{1}{2}$ inches, shortly stalked, elliptic-ovate, acute, crenate-serrate: on the underside gland-dotted and more or less woolly especially in the veins.

Heads few, 3 to 1 inch across, on stalks of $\frac{1}{2}$ to 2 inches, in open corymbs. Inner parts $\frac{1}{3}$ by $\frac{1}{12}$ inch

narrow oblong acuminate into a short or long often recurved awn; outer bracts with shorter broad part, and outermost filiform (i.e., awn only). Receptacle $\frac{1}{6}$ inch: florets about thirty. Achenes nearly glabrous, strongly ribbed. Pappus pale reddish. **t. 251.**

Pulneys: near Kodaikanal—Falconer shola, below Glen Falls and at lower levels. Also Travancore.

Closely allied to V. bracteata *Wall.* of the Himalayas and Khasi mountains.

7. **Vernonia saligna** *DC.*; *F.B.I.* iii 235, V 21. A herb with woody stem, branched upwards. Young parts covered with dense tomentum. Leaves elliptic, acute at both ends, $\frac{1}{12}$ by $\frac{3}{4}$ inch, serrate. Heads numerous $\frac{1}{4}$ inch wide or less, in branched rounded corymbs. Bracts sacute with strong midrib but hardly aristate, scarious with purple tips. Achenes $\frac{1}{12}$ inch; ribs 5, glabrous. Pappus three times as long. **t. 252.**

Pulneys: downs just below Kodaikanal, towards Vilpatti, etc.

Gen. Dist. Nepal to Burma and the Pulneys.

8. **Vernonia Bourneana** *Smith*; *Rec. Bot. Sur. Ind.* vi 101, V 32.* A well-branched dense shrub, peculiar in its arched leaves densely clothed underneath with yellowish hairs.

Shrub 4 to 5 feet high and 5 to 7 feet broad; branches purplish brown and the whole plant up to the involucres thickly coated with yellowish hairs: leaf scars prominent as blunt crescents with three dark scars of the vascular bundles. Leaf-stalks $\frac{1}{4}$ inch: blades elliptic, up to 5 by 2 inches, very occasionally with shallow teeth; pubescent above and roughened by the impressed veins; lighter below and coated with yellowish hairs especially on the nerves, but not white; curving downwards with rounded

backs. Flower-heads in dense terminal corymbose panicles 6 inches across, the branches of which have the same yellowish hairs, and also here and there linear scales with bulbous bases : ultimate peduncles $\frac{1}{3}$ to $\frac{1}{2}$ inch. Involucres $\frac{1}{3}$ by $\frac{1}{2}$ inch : bracts three-seriate, pubescent, with a few linear scales at the base ; the outer greenish, the inner longer and tipped with purplish brown. Florets exserted $\frac{1}{6}$ inch, purple. Stylar arms subulate. Achenes $\frac{1}{12}$ inch, five-angled and obscurely ten-ribbed, covered with white glistening points : pappus white, $\frac{1}{5}$ inch, with a ring of much shorter hairs, $\frac{1}{50}$ inch, outside. **t. 253.**

On the open downs. Pulneys : above Kodaikanal by road-sides, always in dense clumps.

Certain differences between this description and Smith's may be put down to his being made on a single dried specimen, while the above was done in the field. The curved backs of the leaves, not mentioned by Smith, are very characteristic. In bud the leaves are erect with incurved edges and tip and have a thick coating of hairs. The figure shows this well.

* Wrongly named *V. cormorinensis* in my. Fl. N. & P. Ht., p. 218.

Vernonia conyzoides *DC.* ; *Wight's Herb. Prop.* 1387 !, not of *Wight Ic. t.* 829 ; *F.B.I.*, *under* V. cinerea *Less.*, iii 233, V 18.* A sturdy herb distinguished among our species by its narrow pointed involucral bracts.

Stem ribbed, usually unbranched till near the flowering region, sturdy. Leaves erect : stalk $\frac{1}{4}$ to $\frac{1}{2}$ inch, broadened slightly and hairy at the insertion : blade very acute, ovate or oblong-lanceolate, 2 to 3 by $\frac{1}{2}$ to $1\frac{1}{4}$ inches irregularly serrate glabrous or nearly so on the upper side, very pubescent or tomentose with distinct veins and reticulations on the under. Corymbs much branched, terminal on the main stem and leafy branches of the upper axils ; pubescent and with few or no bracts :

ultimate peduncles $\frac{1}{8}$ inch, slender. Heads very numerous, $\frac{1}{4}$ by $\frac{1}{6}$ inch: outer bracts not much shorter than the inner, one-nerved, acute or spine-tipped, pubescent. Achenes hairy, surmounted by a rim of very short, outwardly directed scales: pappus hardly longer than the bracts, white. t. 254.

By woods. Pulneys: Kodaikanal and below. Nilgiris: Ootacamund.

Gen Dist. South Indian hills at high levels.

Considered by some a form of V. cinerea *Less.*, but very different from that plant as it grows on the Madras plains. Close to V. Candolleana *W. & A.*, but in that species the outer pappus scales are erect and neatly half as long as the achene, and the latter are glabrous.

Vernonia Bourdillonii *Gamble; Kew Bull.* 1920, *p.* 339. Small shrub. Leaves 2 inches oblanceolate, white tomentose as underside. Heads few, $\frac{3}{4}$ inch, purple bracts, linear tomentose. Achenes four-angled, nearly glabrous but glandular.

Nilgiris: near Coonoor (P. V. Mayuranathan).

Gen Dist. Travancore in grass lands at over 4,000 feet.

Vernonia Ramaswamii *Hutch.; Kew Bull.* 1916, *p.* 35. Small under-shrub. Leaves 2 by $\frac{1}{3}$ inch, linear lanceolate, not white below, only slightly pubescent. Heads often in a pair on a forking axillary peduncle, $\frac{1}{2}$ to $\frac{3}{4}$ inch; bracts narrow pubescent. Achenes slightly glandular.

Nilgiris: near Coonoor (P. V. Mayuranathan).

Gen Dist. Hills of Tinnevelly and Travancore 4,000 feet in beds of rivers.

ADENOSTEMMA.

Sticky herbs with opposite leaves and terminal corymbs of flower-heads, with florets all tubular and similar and anther-bases rounded and distinguished by the

anthers being cut off square at the top with hardly the flap usual to the family, and the achenes having for pappus four or five club-shaped scales.

Species under 10, all but ours American.

Adenostemma Lavenia *O. Kze*, formerly A. viscosum *Forst.*; *F.B.I.* iii 242, VII 1. An annual of 2 to 3 feet, sticky in all the younger parts. Leaves stalked broadly ovate or deltoid, serrate, with broadly triangular base. Branches of panicle divergent, weak. Stalks of the flower-heads slender, sticky. Involucre hemispheric, $\frac{1}{4}$ inch: bracts obtuse, sticky. Florets small purplish hardly visible, but styles long white, flat-like ligules, making whole head white. Achenes sticky. **t. 255.** *a.* achene; *p.* section across *a*, showing shape.

On the plateaus but commoner at lower levels.

Gen Dist. Throughout India and all tropical countries.

AGERATUM. F.B.I. 78 VIII.

Herbs with opposite leaves, florets all equal and tubular, blue or white never orange, anther bases rounded, stylar arms obtuse, achenes five-angled with five scales for a pappus.

Species about 16 probably all American in origin but now distributed throughout the tropics.

Floss flower, Maudlin; *Fr.* Agerate; *Ger.* Leberbalsam.

Ageratum conyzoides *Linn.*; *F.B.I.* iii 243, VIII; Floss Flower. Remarkable for the long protruding purple styles. Stem 3 to 5 feet, well branched, terete, sparingly hairy. Leaves opposite, stalked, ovate-crenate, about 2 by $1\frac{1}{4}$ inches in corymbs, terminal on the stem and upper branches, with linear bracts at the forkings; ultimate peduncles slender $\frac{1}{8}$ to $\frac{1}{2}$ inch. Involucral bracts

$\frac{1}{8}$ to $\frac{1}{6}$ inch, aristate. Florets purple, stylar branches long, purple. Achenes black, $\frac{1}{8}$ inch, with a rim of five to ten pointed scales about as long. **t. 256.**

Very common in masses by roadsides in Ootacamund and Kodaikanal, e.g., just below the bund. Distributed throughout India and in all warm countries.

EUPATORIUM. F.B.I. 78 IX.

Herbs or shrubs with opposite (or alternate) leaves and terminal corymbs of flower-heads characterized by the florets all equal and tubular, stylar arms long and obtuse, achene five-angled or five-ribbed, and pappus of a single circle of long scabrid hairs (distinction from AGERATUM).

Species about 400, chiefly American.

In England we have *E. cannabinum*, Hemp-Agrimony, *Ger.* Wasserdosten, which is abundant on the temperate Himalayas and occurs also in Khasia and Burma.

Named from one Mithridates Eupator *who is said to have brought the plant into use.*

Eupatorium glandulosum *H.B. & K.*; IX 3. Stem 3 to 6 feet, shrubby, reddish, branched, very glandular on all the young parts and scented with a peculiar acrid odour. Leaves opposite: stalks 1 to 2 inches: blades 1 to 3 by $\frac{3}{4}$ to $1\frac{1}{2}$ inches, thin, trapezoid or almost triangular, with very broadly wedge-shaped and almost horizontal base, crenate-dentate except the basal margin. Flower-heads white in terminal glandular masses, $\frac{1}{3}$ inch, many-flowered: involucral bracts about twenty in two rows, lanceolate acute, shorter than the florets, with two well-defined nerves and scarious margin. Florets white, fragrant: corolla tube $\frac{1}{6}$ inch, slender. Stylar arms long and far exserted, divergent. Achenes black,

glabrous, $\frac{1}{10}$ inch, slender, crowned by a pappus of ten to twelve white scabrid hairs, twice as long. Bot. Mag. t. 8139.

A garden plant, native of Mexico, common as an escape by roadsides in Ootacamund.

Unknown in Ootacamund, I am told, before the beginning of this century, and introduced as a garden plant. Now abundant and a serious pest. By 1920 it was well established on roadsides for a considerable distance down the Seegur Ghaut and along the Coonoor-Kotagiri and the Kotagiri-Kodanad roads as far as the forking to Mettupalaiyam. It has now spread everywhere and quickly covers any abandoned land. It has even Eucalyptus plantations.

Eupatorium odoratum *Linn.* A herb 12 inches high with thin stem and widely diverging branches. Leaves triangular-ovate, entire at the apex, coarsely toothed at the base, three-nerved. Heads in corymbs terminating the branches, cylindrical, florets about 20. Involucral bracts, imbricate, obtuse, strongly three-nerved.

Ootacamund, a garden introduction.

DICHROCEPHALA. F.B.I. 78 XII.

Round-head.

Annual herbs with alternate toothed or cut leaves, and distinguished from all our COMPOSITÆ by the small and almost perfectly spherical flower-heads composed of perfect bi-sexual florets at the top and narrow female flowers round the sides. Anther bases rounded. Stylar arms short flattened. Achenes compressed without pappus or with two small scales.

Species 4 or 5 in Asia and Africa.

Dichrocephala chrysanthemifolia *DC.* (*including D. latifolia* DC.) ; *F.B.I.* iii 245, XII 1 ; round head. An untidy weed with small chrysanthemum-like leaves, widely divergent branches, and small spherical purplish flower-heads.

Stem erect or decumbent ; all green parts covered with short hairs : branches diverging widely. Leaves flaccid, with dull surface, coarsely lobed and toothed, the lowest 2 to 3 inches, pinnatifid or lyrate with broad terminal lobe and narrower lateral ones (*D. latifolia*) ; the upper 1 inch, oblong coarsely toothed or pinnatisect, not stalked, clasping the stem with broad auricles (*D. chrysanthemifolia*) ; or often all leaves one kind or all the other kind. Peduncles $\frac{3}{4}$ to $1\frac{1}{2}$ inches, the longer with a small bract, straight, divaricating. Heads $\frac{1}{6}$ to $\frac{1}{3}$ inch, spherical. Florets all tubular ; outer ones very slender, tubular with four small teeth, appearing to the naked eye as short thick white rods, with style but no stamens ; middle ones (about fifteen) larger, companulate with four spreading lobes, bi-sexual. Achenes obovate, compressed, without pappus. **tt. 257, 258, 259.** Wight. Ic. tt. 1095, 1096 ; Sp. Nilg. t. 108.

Very variable as regards its leaves, and hitherto regarded as two species. My plant No. 2985 (t. 258), collected on the Kodaikanal downs has the characters of both type plants, D. latifolia *DC. Wight Cat.* 1412 (t. 257) and D. chrysanthemifolia DC. Wight Cat. 1413 (t. 257).

On both plateaus, on the open downs.

Gen Dist. Mountains of India from Kashmir to Ceylon, tropical Asia and Africa.

Though Gamble in G.F.M P. still separates the two species, I am convinced that they are both really forms of one.

MYRIACTIS. F.B.I. 78 XV.

A small genus of perhaps only one species, belonging to tropical Asia and Africa ; characterized by the broad flat and daisy-like heads, naked disc, narrow bracts, long strap-shaped, white or blue never yellow, rays, anthers without tails and achene with short beak but no pappus (distinction from ASTER and ERIGERON).

Species 3 or perhaps 1 only in Java, India and Central Asia.

Myriactis Wightii *Wight ; Herb. Prop. ! ; F.B.I. as of* DC., iii 247, XV 1. Stem 5 to 20 inches, pilose. Leaves mostly from near the ground oblanceolate, more or less coarsely toothed or lobed or lyrate, 2 to 3 inches, upper ones 1½ inches, entire, oblanceolate. Flower-heads ¾ to 1 inch, solitary on long axillary peduncles in the upper axils, the uppermost opening first ; then one from a lower axil : involucral bracts narrow, all equal. Ray florets ½ inch, at first white, afterwards turning purple and curling back. Disc florets campanulate, four-lobed, yellow. Achenes egg-shaped, contracted just below the broad summit without pappus. **t. 260.** Wight Ic. 1091 ; Sp. Nilg. 107.

In woods. Nilgiris : near Ootacamund. Pulneys : near Kodaikanal and above. Also Ceylon.

The purple colour of the rays and the diameter of the disc increases with the age of the flowers.

Var. bellioides *Hook. f.* ; a smaller plant with leaves all radical, spathulate and head on a single scape-like stem 5 to 12 inches high. Nilgiris : Bangitappal Valley in open grass.

ERIGERON. F.B.I. 78 XXII.

Fleabane.

Annual or perennial herbs with alternate or radical leaves and rayed flower-heads (of the ASTER kind), often long stalked, and characterized by the ray florets white or blue never yellow, in two or three circles ; involucral bracts many and narrow, and pappus hairs slender and in one circle.

Species perhaps 150, widely distributed in temperate regions and the mountains of both hemispheres, some being ubiquitous weeds. In Britain three species, Fleabane, *Ger.* Beschreikraut, *Fr.* Vergerette.

Very closely allied to ASTER, which however has but one circle of ray florets (except of course garden " doubles ").

KEY TO THE SPECIES.

Erect plants : heads white or purple : leaves mostly basal, oblanceolate. . . . . E. alpinus.
Trailing plant : heads pinkish : leaves narrow.
E. mucronatum.
Heads small, not rayed : leaves narrow. . . E. canadense.

Erigeron alpinus *Linn. ; F.B.I.* iii 255, XXII 5. Root-stock horizontal, thick. Stem 8 to 12 inches, unbranched hairy. Leaves mostly radical, oblanceolate, 2 to 3 inches, upper smaller to ½ inch. Flower-heads few, terminating the stem or peduncled in the upper axils : involucral bracts narrow, in two series, all much alike. Ray florets numerous, in two or more circles Disc florets narrow-cylindrical, not much broader at the top, five-toothed. Anther bases entire, narrowed. Stylar branches with thickened stigma. Achenes hairy with a single circle of under twenty reddish pappus hairs. **t. 261.**

Nilgiris : on the open downs and by roadsides in Ootacamund.

Gen Dist. Mountains of north temperate zone, very variable and widely distributed.

Erigeron canadense *Linn.* A robust well-branched herb, stem and branches covered with short grey hairs, the flowering parts densely so. Leaves narrow linear 1 to 3 inches, the lowest up to ⅙ inch broad, coarsely and distantly toothed. Heads ¼ inch, purplish, mostly in terminal racemes on peduncles of ½ to ¾ inch, outer involucral bracts purple-tipped. Pappus reddish.

A weed of road sides in Ootacamund and Coonoor.

Erigeron mucronatum *DC. ;* XXII 8. Stem and branches slender, from a woody base ; hairs sparingly scattered all over the plant. Leaves mostly narrow

elliptic or oblanceolate, ½ to 1½ inches; some also much larger, ovate or spathulate, entire or coarsely three-toothed or lobed, narrowed to the stalk. Flower-heads solitary, terminal pinkish. Involucre of two or three rows of narrow subulate bracts, ¼ to ⅓ inch long, flat. Ray florets white turning pink, oblong-oblanceolate with a minute notch disc, florets slender. Achene scabrid: pappus of ⅛ inch, long hairs with a few much shorter outside. **t. 262.**

A native of Mexico universal in gardens and originally cultivated under the name Vittadenia triloba.

This species has, in South India, been confounded with Vittadenia australis *A. Rich.*, an Australian plant which is much robust in every way.

CONYZA. F.B.I. 78 XXIV.

Herbs with alternate leaves and terminal corymbs of flower-heads without rays and the florets apparently all similar, but the outer two or three circles slender, two or three-toothed, without stamens and pale gold in colour, the inner florets five-toothed complete with stamens. Anther bases not divided. Stylar arms flattened. Achenes small pappus hairs about ten, short, dilated.

Species about 50 chiefly tropical and sub-tropical, a few in temperate regions.

KEY TO THE SPECIES.

Heads ⅛ inch; leaves obovate to linear, the broader coarsely toothed . . . . C. stricta.

Heads ⅙ inch; leaves mostly narrow, the lower deeply cut . . C. ambigua.

Heads ⅓ to ½ inch, few; leaves serrate, hairy . C. japonica.

Conyza stricta *Willd.; F.B.I.* iii 258, XXIV 6; Kodaikanal Groundsel. A small herb with numerous

small unrayed yellow $\frac{1}{8}$-inch flower-heads, of very slende: florets and pappus, in much-branched terminal corymbs.

Whole plant pubescent, 1 to 2 feet, branched upwards. Leaves obovate and coarsely serrate to oblanceolate-oblong entire, dull-green, erect. Heads very numerous in corymbs, terminal and from the upper axils : ultimate peduncles slender $\frac{1}{8}$ to $\frac{1}{2}$ inch. Involucral bracts $\frac{1}{8}$ inch, narrow with scarious edges, densely pubescent. Outer florets tubular, very slender, minutely toothed : inner bell-shaped ones few, five-lobed. Achenes slender, $\frac{1}{40}$ inch, pappus hairs few and fine. **t. 263**.

In waste places and dry soil, very common on the plateaus and in dry places generally.

Gen. Dist. South-east Himalayas and the South Indian mountains.

Conyza ambigua *DC*, formerly Erigeron linifolius *Willd.* ; *F.B.I.* iii 254. Branched or not, 12 to 24 inches. Leaves narrow, linear to oblanceolate, 1 to 2 inches by $\frac{1}{16}$ to $\frac{1}{4}$ inch, the broader ones very coarsely serrated, erect or weakly spreading. Heads $\frac{1}{6}$ inch, peduncles $\frac{1}{8}$ to $\frac{1}{4}$ inch, slender in terminal and axillary panicles, glabrous or hairy. Involucral bracts $\frac{1}{6}$ to $\frac{1}{5}$ inch linear, coarsely hairy. Florets small, pale. Achenes $\frac{1}{20}$ inch ; pappus $\frac{1}{8}$ inch, pale, yellowish. **t. 264**.

A weed, on all three plateaus.

Conyza japonica *Less.* ; *F.B.I.* iii 256, XXIV 2. Stem 6 to 12 inches, woody or glabrate, not or little branched. Leaves sessile, obovate, spathulate, coarsely serrate, often but not always with dilated auricular base. Heads $\frac{1}{3}$ inch diameter nearly sessile in terminal rounded corymbs. Involucral bracts acute, with hairy middle part and scarious margins. Receptacle pitted and fimbriate.

Achenes very small, pinkish purple. Pappus $\frac{1}{4}$ inch, silky, slightly red or pinkish. **t. 265.**

On paths and bare places on both plateaus.

Has the habit of Blumea hieracifolia, cf. p. 324.

BLUMEA. F.B.I. 78 XXVI.

Annual or perennial herbs with alternate woolly or glandular pubescent leaves, often strongly scented. Flower-heads variously arranged ; without rays, and all the florets tubular and apparently similar ; but several outer circles slender two or three-toothed, without stamens. Inner few or absent, five-toothed : anther bases divided into short slender tails. Stylar arms flattened : achenes small with a single circle of slender caducous pappus hairs.

Species about 60 in tropical and sub-tropical parts of Asia, Africa and Australia, very common in India.

A very difficult genus, the species being inconstant in leaves and other respects.

KEY TO THE SPECIES.

Leaves mostly radical ; heads in close clusters terminating the stem and lateral branches : florets yellow, exserted from involucre . . . . B. hieracifolia.

Stem simple : radical leaves present or not : stem leaves truncate or clasping at base, woolly ; clusters terminal, close ; florets purple, not exserted . . . B. macrostachya.

Stem branched upwards : heads in open panicles, purple ; leaves coarsely toothed. B. Wightiana and B. neilgherrensis.

Blumea neilgherrensis *Hook. f. ; F.B.I.* iii 261, XXVI 4. Strongly aromatic and woolly all over. Leaves obovate acute, from 3 to 4 by $1\frac{1}{4}$ to 2 inches near the base to 1 by $\frac{1}{2}$ inch near the flowering part, sharply dentate-serrate with teeth $\frac{1}{8}$ to $\frac{1}{6}$ inch apart. Heads numerous soft : involucral bracts very slender woolly.

Florets purple, lobes and achenes glabrous; pappus copious. **t. 266.**

On the open downs, flowers in June. Nilgiris: common. Pulneys beyond the Observatory.

This should probably be regarded as the hill form of B. Wightiana *DC.* and perhaps not really separable from it. It varies much in habit being small or large, the stem simple or copiously branched, but always hairy at these levels, at lower levels it passes into the next species which is less hairy, has thinner leaves, & corolla lobes and achenes glandular.

Bhumea Wightiana *DC.; F.B.I.* iii 261, XXVI. 3: as above.

Shevaroys: near Yercaud. Also Horsleykonda, etc.

Blumea hieracifolia *DC.; F.B.I.* iii 263, XXVI 11. Stem usually unbranched, erect, 1 to 2 feet. Leaves mostly near the ground and forming a rosette, obovate spathulate, serrate; undersides woolly, as also the upper parts of the stem and especially the involucres. Heads close together in one or more compact masses forming elongate panicles: bracts narrow, hairy, the inner purple-tipped and longer than the outer: receptacle naked. Florets yellow. Pappus copious, white. Wight Ic. t. 1099. **t. 267.**

Nilgiri and Pulney downs, chiefly near water. Flowers in May.

Gen. Dist. Hilly parts of India.

Blumea macrostachya.: stem simple, whole plant very cottony. Radicle leaves if present up to 3 by 1 inch, obovate and forming a rosette, but usually absent at time of flowering; stem leaves up to 2 by $\frac{3}{4}$ inch, oblong, elliptic, acute, with truncate stem-clasping base. Heads in a compact terminal cluster. Florets purple not exserted from involucre, and bracts also often purple. Achenes five-angled, scabrid on the angles. Pappus white, **t. 268.** See note in Jour. Ind. Bot. Soc. XI (1932)i.

Pulneys : on the downs in damp hollows, and semi-swampy ground. The stem varies from 5 to 15 inches, and the whole plant from somewhat to very woolly.

This is apparently included in *G.F.M.P.* as variety *macrostachya* of the last species : but the purple florets not exserted, and purple bracts (discernible even in dried specimens) as well as the general habit appear to me to mark it as a distinct species.

G.F.M.P. has two other plants—B. membranacea *DC.*, a low level species with var. Gardneri having large heads at Coonoor, and B. jacquemontii, also at Coonoor, both with yellow flowers, but I have not seen them.

LAGGERA. F.B.I. 78 XXVII.

A small genus, distinguished among all our COMPOSITÆ by the wings on the four angles of the stem and branches. Annual or perennial herbs with alternate leaves, decurrent as wings, and loosely panicled unrayed flower-heads characterized by the involucral bracts in several series, the outer shorter than the inner, rather rigid and spreading : receptacle without scales : florets all tubular and slender, the outer in several series, female only ; the central ones complete : anther bases divided : achenes with one circle of hairs. Very similar to BLUMEA in most respects, but the anther bases less cordate Our species, however, are most easily recognized by the winged stems, and may be distinguished especially when young by smell.

Species about 10 in tropical Africa and India.

Wings entire, stem sturdy . . . . L. alata.
Wings cut up irregularly : stem slender . . L. pterodonta.

Laggera alata *Schultz ; F.B.I.* iii 271, XXVII 2. Stem as thick as a lead pencil, very rough with hardened leaf-bases, in the younger parts densely pubescent, almost woolly : wings wavy but even in width. Leaves broadly-oblanceolate to ovate or oblong, up to 2 to 4 by $\frac{3}{4}$ to $1\frac{1}{4}$

inches at the widest and $\frac{1}{2}$ inch at the base, sharply serrate with triangular teeth $\frac{1}{16}$ to $\frac{1}{8}$ inch apart, pubescent above, tomentose below especially on the nerves. Flower-heads peduncled in the axils of the upper leaves or on short lateral branches forming a large terminal leafy panicle. The heads facing downwards. Heads *conical*, $\frac{1}{2}$ by $\frac{1}{4}$ *inch, with flat base*; lower bracts recurved, stiff. **t. 269.** Wight Ic. t. 1101.

Nilgiris and Pulneys: on the open downs, also Shevaroys; flowering in the winter months.

Gen. Dist. Mountains of India proper, tropical Africa, Java, China and Philippines.

The stems die down or are burnt down every year, and the young shoots which come up after the first rains have large soft leaves smelling strongly of Black-current.

Laggera pterodonta *Benth.; F.B.I.* iii 271, XXVII 3. Stem and branches slender, glabrous: wings very irregular, interrupted and deeply toothed. Leaves glabrous, thin, ovate lanceolate or oblanceolate, sessile, toothed or pinnatified at the base; on the main stem 5 by 1 to 2 by $\frac{1}{2}$ inch; on the branches smaller. Flower-heads peduncled in the upper axils, purple. Wight Ic t. 1100.

Nilgiris and Pulneys at rather lower levels.

Gen. Dist. Mountains of South India, tropical Himalayas, Assam and Burma, tropical Africa.

Smell of young leaves faint, and rather like that of a Strawberry.

ANAPHALIS, GNAPHALIUM *and* HELICHRYSUM. F.B.I. 78 XXXIX & XLIII.

Cudweed, Everlasting, etc.

Characterized chiefly by the scarious glistening bracts which stand up round the flower-head (*Cudweed*) or spread out as a white border round it (*Everlasting*):

also by the arrangement of the heads in close masses, and by a cottony covering on all green parts.

Florets all tubular, slender : outer ones female only (without stamens but) fertile : inner with stamen and style but infertile, stylar arms short obtuse, closed. Achenes small with one circle of mostly simple pappus hairs.

The differences between the genera are minute and difficult of determination but our species of HELICHRYSUM have the veins very distinctly impressed like grooves on the upper side : this is not so in our species of ANAPHALIS ; and those of GNAPHALIUM have golden involucral bracts.

ANAPHALIS—30 species in Asia, in mountain climates of the warmer zones ; a few in Europe and North America.

HELICHRYSUM—300 species, half of them in South Africa, others in Australia, tropical Africa, south Europe and the Mediterranean region : in India only a few.

In England four species of GNAPHALIUM and of FILAGO constitute the "Cudweeds." *Ger.* Ruhrkraut. Two species of ANTENNARIA are 'Ever lasting.'

KEY TO THE SPECIES.

a { Leaves with distinct midrib only . . . . *b*
Leaves with 3 to 7 veins . . . . *i*

b { Bracts of involucre spreading—white or pink . ANAPHALIS. *c*
Bracts of involucre erect not spreading, golden . . GNAPHALIUM . . . *m*

c { Most leaves flat, upper only with recurved margin. 4. A. Lawii.
Leaf-margin strongly recurved . . . . *d*

d { Upper side of leaf green though more or less cottony . *e*
Both sides of leaf white with wool . . . . *g*

e { Leaves narrow, not broad at base . 6. A. marcescens.
Leaves with broad, stem-clasping base . . . . . . *f*

f { Heads $\frac{1}{10}$ inch ; leaves strongly scented, tapering to the point . . . . 7. A. aristata.
Heads $\frac{1}{4}$ inch ; leaves oblong, hardly scented . . . 8. A. Wightiana.

g { Leaves 1 inch, narrow: heads $\frac{1}{3}$ inch diameter: stems slender, tall . . . . 9. A. leptophylla.
Leaves under 1 inch, stem much branched and woody below . . . . h

h { Branches slender: heads $\frac{1}{4}$ to $\frac{1}{3}$ inch (Pulneys) . 10. A Bournei.
Branches thick: heads $\frac{1}{5}$ to $\frac{1}{4}$ inch (Nilgiris). 11. A. neelgerriana.

i { Veins impressed on upper side of leaf . HELICHRYSUM o.
Veins not impressed: leaves woolly on both sides . j

j { Much branched, rounded shrubs: bracts obtuse . . l
Not much branched: bracts acute . . . . k

k { Leaves white . . . . 3. A. elliptica.
Leaves tawny . . . . 5. A. Notoniana.

l { Veins of leaf 5: flower-heads $\frac{1}{8}$ inch 1. A. Beddomei.
Veins 3: heads $\frac{1}{3}$ inch . . . . . . 2. A. travancorica.

m { GNAPHALIUM. (p. 334).
Heads in a terminal mass . . . . n
Heads on short leafy branches . . . G. indicum.

n { Leaves oblong, spathulate, white; heads golden . . . G. luteo-album.
Leaves linear acuminate: heads pale yellow. G. hypoleucum.

o { HELICHRYSUM
Upper side of leaf green . . . . . . H. buddleoides.
Upper side of leaf cottony . . . . H. Hookerianum.
Both sides of leaf woolly (see . . . . e. H. Wightii.

1. **Anaphalis Beddomei** *Hook. f.*; *F.B.I.* iii 282, XXXIX 12. Grows in loose masses, 2 to $2\frac{1}{2}$ feet high, the stems ending in irregular cymose corymbs of small flower-heads.

Main stem decumbent, 1 inch thick, with brown scaly bark; stems or branches numerous curving upwards, clothed below with dead leaves, above with green more or less erect leaves 1 inch apart. Leaves oblanceolate, clothed above and below with close wool, which however does not hide the five, or at the base seven, veins prominently raised in the lower side, but impressed in the

upper and curving forwards to meet at the tip. Flower-heads in small corymbs on peduncles, the outer of which are much the longer, so that the whole inflorescence is depressed in the centre ; bracts oblong, all close set against the axis, the lowest 1 inch ; central corymbs opening and fruiting first. Heads small, the involucres campanulate, $\frac{1}{8}$ by $\frac{1}{6}$ inch : bracts glistening white, oblong or rounded not spreading. Disc $\frac{1}{10}$ inch or more across. Corolla $\frac{1}{10}$ inch above the minute ovary. Achenes $\frac{1}{50}$ inch oblong. After the fall of the fruits the receptacles appear as small discs $\frac{1}{6}$ inch diameter surrounded by a wing $\frac{1}{8}$ inch wide, the inner half brown, the outer glistening white.

Easily distinguished from *A. travancorica*, which it much resembles in growth, by the smaller more spreading leaves, set at longer internodes, and the small flower-heads in loose corymbs also by not smelling, like it, of curry. **t. 270.**

On the Pulney downs, common.

Named by Sir Joseph Dalton Hooker after Colonel Beddome who sent the plant to Kew about 1880.

2. **Anaphalis travancorica** *Smith ;* XXXIX 12.* Grows in dense whitish tufts, 1 to 2 feet in height and up to six feet across, of numerous stems that end in closely packed very cottony oblanceolate leaves and are clothed below by the dead ones ; the flower-heads $\frac{1}{3}$ inch across in bunches of 2 inches diameter, raised a few inches only above the general level.

Main stem woody, an inch thick, decumbent on the ground ; upright stems as thick as a lead pencil, clothed for the most part with numerous brownish-grey dead leaves, above very cottony. Leaves close set except

near the flowering region, $\frac{1}{4}$ inch only apart, oblanceolate or spathulate, acute, clasping the stem by a broad base, concealed by cottony web : midrib prominent, but the pair of lateral nerves visible only when the cottony covering is removed, and margin reflexed. The lower of the still green leaves spread outwards, the younger arching over the bud.

Flower-heads in corymbose panicles of lower bracts leaf-like, upper triangular acute, and uppermost very cottony except for the scarious tip. Involucral bracts many-seriate, the ends of the outer reflexed and forming a glistening white fringe $\frac{1}{16}$ inch round the disc ; the innermost erect, oblanceolate-oblong and green except at the tip. Disc $\frac{3}{16}$ inch, remarkably uniform in size. Florets $\frac{1}{10}$ inch, their upper halves yellow. Achenes brown, $\frac{1}{100}$ inch, densely papillate. After the dispersion of the fruits the receptacles appear as greenish papillate discs surrounded by flat wings $\frac{1}{8}$ inch wide of narrow bracts. The whole plant has strong smell of curry. **t. 271.**

Quite common on the Pulney downs above Kodaikanal especially where exposed to alternate dry winds and fog. Also hill of Travancore.

3. **Anaphalis elliptica** *DC.* ; *F.B.I.* as variety of the next, iii 283, XXXIX 14. Leaves broad, as broad as $1\frac{1}{4}$ by $\frac{3}{4}$; three-ribbed from the base, otherwise much as in A. Lawii to which it is clearly very closely allied.

Nilgiris : above 7,000 feet, slopes of Snowdon : path to Marlimund lake, etc.

4. **Anaphalis Lawii** *Gamble*, formerly included in A. oblonga DC.; *F.B.I.* iii 283, XXXIX 14.

Stem cottony, often unbranched below the flowering region, 1 to 2 feet ; base clothed with dead leaves. Leaves

sessile, erect, oblong or oblanceolate, acute, usually $\frac{3}{4}$ to $1\frac{1}{4}$ by $\frac{1}{6}$ to $\frac{1}{2}$ inch, one-nerved, cottony ; margin nearly flat ; base broad. Heads in compact terminal masses, in fruit in broad depressed terminal corymbs carried high by the lengthening of the flowering stem : involucral bracts acute, shining white or pink. Very variable as regards size of leaf. **t. 272.**

Nilgiris, Pulneys, Shevaroys. Common everywhere on the plateaus, especially on rather poor soil and then often only 3 to 4 inches high.

Gen. Dist. Western Ghauts and Ceylon.

5. **Anaphalis Notoniana** *DC.* ; *F.B.I.* iii 284, XXXIX 17. Distinguished among our species by the broad obtuse often notched involucral bracts, and short thick soft leaves. Stem branched from the base and leafy to the ends of the branches, very woolly. Leaves oblong, obtuse, equally softly woolly on both sides, one-nerved. Heads crowded at the ends of the branches. Involucral bracts obtuse, erect, glistening yellow or pink, scarious and wrinkled.

Nilgiris : Dodabetta, Church Hill, Ootacamund, Avalanche, on hill above bungalow. Flower May.

6. **Anaphalis marcescens** *Clarke* ; *F.B.I.* iii 286, XXXIX 25. Stem slender, twiggy, much branched. Leaves linear or tapering $\frac{3}{4}$ to $1\frac{1}{2}$ inch, one-nerved, with strongly revolute margins, glabrous on the upper side, woolly on the under, like the stem. Heads $\frac{1}{6}$ inch diameter in rounded terminal corymbs. Bracts glistening white, lanceolate. Wight Ic. t. 1115.

Nilgiris : Kotagiri ; flowers January to June.

Var. Leaves narrower and shorter ; pappus reddish ; on the banks of streams or wet rocks, Bangitappal valley, etc. This is by some considered a different species.

7. **Anaphalis aristata** *DC.; Herb. Wight's Prop.* 1470*!; F.B.I.* iii 285, XXXIX 22. A green plant with sticky leaves and small flower-heads, with aromatic or curry smell.

Stem woody at the base with numerous, erect, flowering branches, glandular-pubescent but not cottony. Leaves clasping the stem with acute auricles, oblong, acute or tapering from the clasping base to the apex, $1\frac{1}{4}$ to 2 inches by $\frac{1}{6}$ to $\frac{1}{3}$ inch; margin recurved: lower side white with single midrib; apex mucronate and turned downwards. Heads very numerous, $\frac{1}{8}$ inch, bunched in more or less compact lumpy corymbs; bracts glistening rounded, with minute teeth, rose-coloured when young, afterwards bleaching at the tips. **t. 273.** *b.* fertile pistillate flower; *c.* staminate flower. Wight Ic. 1119.

Pulneys: Kodaikanal downs, etc. Nilgiris: Avalanche, etc. (*Wight*); in rather dry places, on the edges of cattle tracks, etc.

8. **Anaphalis Wightiana** *DC.; F.B.I.* iii 286, XXXIX 23. Distinguished from *A. aristata* by its larger ($\frac{1}{4}$ inch) flower-heads and its thicker, shorter, blunter and more numerous leaves and not so strongly scented.

Stem 6 to 12 inches woody below andclothed with dead leaves; branching corymbosely above. Leaves white underneath, green on the upper side, oblong obtuse, one-nerved, with short recurved tip, revolute margin, and broad stem-clasping base: upper leaves erect and closely appressed to the stem and those near the flower-heads cottony. Heads $\frac{1}{4}$ inch rather long, with several rows of bracts, cottony: disc $\frac{1}{8}$ inch, margin of acute bracts 1/16 inch: peduncles and lower part of involucres densely cottony or tomentose. **t. 274.** Wight Ic. t. 1117.

In damp and cool places, on banks of streams, etc. Nilgiris : on the downs common especially south and west towards Pykara and Bangitappal. Pulneys : near Kodaikanal, Shevaroys.

9. **Anaphalis leptophylla** *DC.; F.B.I.* iii 285 XXXIX 21 ; White Everlasting. Distinguished from *A. Lawii* by its much narrower leaves and larger flower-heads and by growing in dampish soil.

Stem slender, branched or not, silvery white with closely appressed hairs. Leaves linear or linear oblanceolate, $\frac{1}{2}$ to 1 inch, mucronate, white with thin cotton on both sides : midrib strong : margin revolute. Heads when fully open $\frac{3}{8}$ inch, pure white with yellow centre : lower half of bracts scarious with green nerves, glistening : upper half spreading outward as a fringe round the disc : disc $\frac{1}{4}$ inch yellow : receptacle glabrous. Achenes ovoid. Pappus hairs feathery towards the base.

Pulneys : in damp places, e.g., near a marsh, on the downs Nilgiris. Flower September.

10. **Anaphalis Bournei** *Fyson ; F.B.I. included in* A. brevifolia *DC.*, iii 286 ; XXX 26.*

Stem shrubby below and much branched, the whole plant as a rounded mass with the habit of A. Beddomei and A. travancorica : covered with a closely adpressed felt of white hairs. Leaves $\frac{1}{3}$ to $\frac{1}{2}$ by $\frac{1}{12}$ inch, acute : upper erect and appressed to the stem, lower spreading : margin revolute ; midrib distinct. Flowering branches 6 to 10 inches, somewhat less leafy upwards. Heads $\frac{1}{4}$ inch : border of white scales $\frac{1}{12}$ inch. **t. 275.**

Pulneys : by roadsides above Kodaikanal lake, common. Not elsewhere.

Closely allied to A. brevifolia *DC.* ; a Ceylon species, but differing in its narrower longer leaves not in general closely appressed to the stem and more widely spreading on the scapes. Plants from Kotagiri, Courtallum, and the Anamalais seem to be intermediate between these two.

11. **Anaphalis neelgerriana** *DC.* ; *F.B.I.* iii 287, XXXIX 270. A white very small-leafed shrub characteristic of dry and exposed situations on the Nilgiris.

At its best 3 or 4 feet high and as broad, with numerous ascending, usually opposite branches, clothed below by the dead leaves : bark of stem rough and corky. Leaves bluey-white, $\frac{1}{4}$ by $\frac{1}{20}$ inch, coated with soft white cotton closely appressed to the surface, with recurved margins and one central vein : when young erect, later spreading, and finally depressed close against the axis and persistent there, very numerous and close set. Heads in open corymbose panicles 2 to 3 inches, across terminating erect branches 4 to 5 inches high, clothed to the top with closely appressed leaves : disc $\frac{1}{6}$ to $\frac{1}{5}$ inch, surrounded by a white rim of involucral bracts $\frac{1}{16}$ inch. **t. 276.** Wight Ic. 478.

Nilgiris : in dry and exposed places. Not Pulneys. On the Pulneys this plant is represented by *A. Bournei.*

GNAPHALIUM.

Differs from ANAPHALIS in that a few of the hermaphrodite (disc) flowers are fertile having divided styles.

About 100 species in all the cooler parts of the world.

Gnaphalium luteo-album *Linn.* ; *F.B.I.* iii 288, XLII 1. *Var.* pallidum. An annual weed, stem 6 to 10 inches, leaves 1 to 2 inches, linear oblanceolate whitish with adpressed hairs. Heads often in sessile terminal clusters. Bracts obtuse, glistening a golden colour. Achenes papilose : pappus staining yellow.

A common weed all over the plateaus. The species extends on mountains all over India and to Japan.

Gnaphalium hypoleucum *DC.*; *F.B.I.* iii 288, XLIII 2. Stem 12 inches or more. Leaves lanceolate clasping the stem with a broad base not unlike the *A. aristatas* but not sticky or scented, the involucral tracts more shiny and a golden colour and spreading, and the disc larger to $\frac{1}{6}$ inch. **t. 277** (in bud only and radiating bracts not shown).

Nilgiris and Pulney hills above 7,000 feet.

Gnaphalium indicum *Linn.*; *F.B.I.* iii 289, XLII 3. Stem 6 to 10 inches high, branched. Leaves obovate long-stalked or spathulate, 1 to 2 inches by $\frac{1}{3}$ to $\frac{1}{2}$ inch. Heads few, in sessile bunches with leaves close below, terminating the short lateral branches; lower involucral bracts green woolly, upper scarious, not spreading. Florets pink-tipped. Pappus white.

A weed on paths, etc.

HELICHRYSUM.

Similar in general character of the flower-head to ANAPHALIS, but all or most of the hermaphrodite (disc) florets fertile (with divided style) and pappus scabrid Our species distinguished from those of ANAPHALIS (ex. A. Beddomei) by the leaves having 5 to 7 veins, from the base, strongly impressed on the upper surface.

About 300 species from Madagascar, Australia, tropical and North Africa.

Helichrysum buddleoides *DC.*, *F.B.I.* iii 290, XLIII. Stem 2 to 4 feet, white above, $\frac{1}{6}$ inch thick. Leaves elliptic lanceolate or oblanceolate, acute, spreading, 2 to 4 by $\frac{1}{2}$ to 1 inch, greenand glabrous above, white, as

are all the other green parts, with thick adpressed tomentum, underneath ; veins 5 to 7. Corymbs terminal, 4 to 8 inches across ; clusters of flower-heads globose $\frac{1}{2}$ to 1 inch. Heads yellow, $\frac{1}{6}$ inch, outer bracts, woolly, inner glistening. Anthers with long slender tails. Achenes scabrid, with pappus of scabrid hairs. **t. 278.** *c.* tubular floret ; *d.* filiform floret [*E.T.B.*]. Wight Sp. Nilg. t. III ; Ic. t. 1113.

Nilgiris : on Snowdon ; flowers in January. Coonoor. Pulneys : at lower levels—Shembaganur.

Gen. Dist. Western Ghauts, Mysore, Bababoodons, Anamalais and Ceylon.

Helichrysum Hookerianum *W. and A.; F.B.I.* iii 291, as a variety of H. buddleoides, but leaves cottony on upper side with veins not so distinctly impressed ; lower side and stem very woolly.

Nilgiris : Lovedale (P. V. Mayuranathan) formerly recorded from Annamalai, Pulney, Travancore and Tinnevelly hills to 4,500 feet.

Helichrysum Wightii *C.B. Clarke ; F.B.I.* iii 291, XLIII 2. Lower parts of stem clothed with dead leaves; middle part with leaves densely woolly on both sides, but with veins clearly impressed ; upper part under the flower heads nearly bare of leaves. Heads in open panicles.

Grows in dense masses colouring the hill-side above Sisparah silvery white. Flower May.

A very large flowered species, the heads an inch or more across is common about Kodaikanal and Coonoor as a garden escape. It appears to be a golden variety of H. niveum Graham, a native of the Swan river Australia, of H. macrantha.

MOONIA F.B.I. 78 L.

(*previously named* CHRYSOGONUM).

Herbs or undershrubs with opposite toothed or pinnately compound leaves and flower-heads of the HELIANTHOIDEÆ (see p. 302). Ray florets (without stamens) alone fertile and their achenes flattened and embraced by the floral scales : pappus very small or 0 : disc florets with stamens and undivided styles, unfertile.

Species 6, in Australia 3, India 2, America 1.

Moonia heterophylla *Arn.* formerly Chrysogonum heterophyllum *Benth. ; F.B.I.* iii 303, L 1. Annual, glabrous 3 to 4 feet. Leaves pinnate or pinnatifid : leaflets or segments ovate-lanceolate acute, sharply serrate or gashed, pilose above, pubescent underneath. Flower-heads in irregular umbels or corymbs ; ultimate peduncles ½ to 2 inches. Involucral bracts three or more nerved irregular in length ; outer long and green ; inner shorter. Ray florets white : inner yellow. Achenes without pappus. **t. 279.** Wight Sp. Nilg. t. 110.

Very common round woods on the Pulney and Nilgiri downs. Flowers from March to August.

Gen. Dist. Also Ceylon.

Moonia Arnottiana *Wt.*, formerly Chrysogonum Arnottianum *Benth. ; F.B.I.* iii 303, L 2. A perennial under shrub. Similar to the above but leaves larger and flower-heads larger, up to 1 or 1½ inches diameter and with more ray florets and these yellow. Wt. Ic. t. 1105.

Nilgiris : margins of sholas between Avalanche and Sispara. Mukarate Peak.

The large leaves and yellow rays alone distinguish this from the preceding. Perhaps both should be regarded as varieties of one species.

SIEGESBECKIA. F.B.I. 78 LII.

A small genus of but two species, one cosmopolitan in all warm countries, the other in Peru.

Siegesbeckia orientalis *Linn.* ; *F.B.I.* iii 304, LII 1. Remarkable for the four or five, $\frac{1}{2}$ inch long, narrow sticky bracts below the globular flower-heads.

Stem 1 to 3 feet, pubescent, cymosely branched upwards. Leaves opposite, stalked, 2 to 3 by 1 to $1\frac{1}{2}$ inches, ovate, coarsely round-toothed, and base deltoid. Heads terminal, peduncled in the cyme forkings : outer bracts linear, $\frac{1}{2}$ inch spreading, thickly covered with glands ; inner spathulate $\frac{1}{8}$ to $\frac{1}{6}$ inch : floral scales boat-shaped pubescent above. Florets yellow : rays broad three-lobed. Anther lobes acute. Stylar arms flattened, rather broad. Achenes black, smooth. **t. 280.** Wight Ic. t. 1103.

Shevaroys on the plateau : and at to lower levels, but occurs occasionally on the Pulney and Nilgiri downs.

Gen. Dist. Throughout India and all warm countries.

SPILANTHES. F.B.I. 78 LVIII.

Annual herbs with opposite leaves, and long-stalked globular or conical, often very tall, flower-heads, of the tribe HELIANTHOIDEÆ (p. 302). Achenes without pappus but sometimes with a few bristles.

Species 20, chiefly American.

Spilanthes acmella *Linn.* ; *F.B.I.* iii 307, LXIII 1. Easily distinguished among our COMPOSITÆ by the conical, bright yellow flower-heads without rays. Stem weak or more or less erect. Leaves triangular ovate, with shallow serrations, three-nerved at the base,

pubescent as are all green parts. Peduncles 2 to 4 inches, heads $\frac{1}{2}$ by $\frac{3}{4}$ inch. Involucral bracts few. Florets all tubular, funnel-shaped, yellow with scales between. Achenes compressed, $\frac{1}{8}$ inch long, black, contracted below the small terminal areola. **t. 281.**

Nilgiris : A wayside weed, common, Ootacamund, Kotagiri, Coonoor, etc. Shevaroys.

Gen. Dist. Throughout India and all warm countries.

BIDENS. F.B.I. 78 LX.

Bur-marigold.

Herbs with opposite leaves and flower heads of the HELIANTHOIDEÆ (p. 302) distinguished from all others by the achenes having at the top two to four *barbed* spines.

Species 50, chiefly in America.

Bidens pilosa *Linn. ; F.B.I.* iii 309, LX 3. Stem erect four-angled, glabrous or nearly so, leaves opposite pinnately three-foliate or three-fid ; terminal leaflet or segment sharply serrate except perhaps the acuminate apex, 2 to $\frac{3}{4}$ inch ; lateral 1 to $\frac{1}{2}$ inch shortly petioled. Flowering portion cymosely forked ; ultimate peduncles 1 to $2\frac{1}{2}$ inches stout : bracts $\frac{1}{2}$ inch. Involucral bracts with broad scarious margins. Ray florets yellow or white. Achenes black narrow, angled, exceeding the involucre and surmounted by two awns with many downward pointing barbs. **t. 282.**

A wayside weed. Nilgiris : Ootacamund and lower levels. Pulneys : Kodaikanal down to the plains. Shevaroys, Horsleykonda.

Gen. Dist. Throughout India and in all warm countries. *Fr* Bident. *Ger.* Zweizahu.

Bidens humilis *H. B. and K.* ; LX 4. Stems weak, spreading. Leaves finely pinnately dissected into narrow segments. Rays few spreading, ½ inch, conspicuous. Achenes black with two very short barbed awns. **t. 283.**

Roadsides in Ootacamund common, conspicuous in December. Not collected on Pulneys.

An introduction from the highlands of tropical America.

GALINSOGA. F.B.I. 78 LXII.*

Annual herbs with opposite leaves and small flower-heads of the HELIANTHOIDEÆ (p. 302), with white rays. All the florets fertile : floral scales boat-shaped : achenes angled or compressed, surmounted by a few scarious entire awned or fimbriate scales.

Species 5, in tropical America.

Galinsoga parviflora *Cav.* ; *F.B.I.* iii 311, LXII * 1. A small weed with opposite three-nerved leaves and rather few flower-heads on slender stalks of unequal length.

Annual 3 to 20 inches, nearly glabrous, except in the youngest parts, cymosely branched upwards. Leaves shortly stalked, ovate acute or acuminate, sub-serrate, three-nerved from the base : uppermost leaves narrow, sessile. Peduncles slender ½ to 1 inch, often in terminal unequal pairs. Heads ⅙ inch : bracts broad, smooth, with three or more veins. Achenes black wedge-shaped with a ring of about ten white oblanceolate feathery scales. **t. 284.**

Nilgiris : as a weed at Ootacamund. Recorded for the first time in the Fl.N. & P.Ht. (1914), now abundant.

Gen. Dist. A weed from America now distributed in South Africa, New Zealand, Himalayas and in Great Britain.

COTULA. F.B.I. LXIII.

Small herbs with alternate pinnately cut leaves, and small, long-stalked, unrayed flower-heads, characterized by the achenes being stalked, and without pappus and some flattened.

Species 40 in temperate and tropical climates.

Cotula australis *Hook. f.*; LXIII 4. Stem and branches $2\frac{1}{2}$ to 4 inches. Leaves $\frac{1}{4}$ inch pinnatisect into linear segments. Heads $\frac{1}{6}$ inch, on leafless continuation of the branches: outer involucral bracts oblong obtuse, one-nerved, with broad scarious margin: receptacle naked but for the persistent cylindrical scales of the outer florets. Outer florets without corolla, of inner the corolla four-lobed. Outer achenes obovate, black with green border; those of disc rough, thick winged, notched at the top and tubercled or glandular.

Weed. A native of Australia and New Zealand, probably introduced with garden seed. On damp paths, etc.

ARTEMESIA. F.B.I. 78 LXXII.

Herbs or at times shrubby highly aromatic plants, with alternate leaves, usually much divided and often white underneath, and small round flower-heads set in slender spikes, which form large leafy panicles. Involucral bracts round, scarious-margined. Receptacle without scales. No ray-florets. Achenes minute and without pappus.

Species about 200 in the cooler climates of almost the whole northern hemisphere, a few in South America and the Sandwich islands. In Europe several species are cultivated in gardens.

Leaves white underneath . . . . A. vulgaris.
Leaves green underneath . . . . A. parviflora.

Artemesia parviflora *Roxb.* ; *F.B.I.* iii 322, LXXII 5. Stem 2 to 5 feet grooved. Lower leaves wedge-shaped, coarsely toothed along the broad further margin : upper pinnatifid with narrow segments, sparingly hirsute : all with a pair of narrow stipular-like segments at the base. Panicle 12 inches high by 4 inches wide. Heads $\frac{1}{8}$ inch. Involucral bracts broad, obtuse. Florets few, some with large anthers, but only an aborted ovary and undivided style. Achenes ellipsoid, smooth. **t. 285.**

Nilgiri and Pulney downs, common. Flowers colder months.

Gen. Dist. Mountains of India (not Ceylon).

Artemesia vulgaris *Linn.* ; *F.B.I.* iii 325, LXXII 14. Mugwort. Tall aromatic herb or shrub growing to 5 or 6 feet. Leaves pinnatisect, white tomentose below, aromatic. All florets fertile.

Nilgiris : on the downs in dense patches, possibly the sites of former dwellings. Pulneys : apparently truly wild on the downs. Also near villages, e.g., Vilpatti.

Gen. Dist. Wild on the Bombay Ghauts and mountains of India and temperate regions of the northern hemisphere. Also cultivated.

Formerly much used in Europe, as elsewhere, for flavouring dishes and drinks, whence the English Mugwort, Mugwood, Muggert or Mugger ; *Ger.* Beifuss, Biboess ; *Fr.* Armoise.

GYNURA. F.B.I. LXXVI.

Succulent herbs with alternate coarsely toothed or entire leaves and unrayed flower-heads with involucres of the SENECIO type (p. 303) and a few small bracts below, but distinguished from SENECIO and also from NOTONIA and EMILIA by the stylar arms being hairy, slender, and tapering to a fine point.

Species about 20 in the warm parts of Asia, Africa and Australia.

Gynura nitida *DC.; Wight's Herb. Prop.; F.B.I.* iii 333, LXXVI 1. Herb, 2 to 5 feet, glabrous except near the flower-heads. Leaves mostly towards the base of the stem or branches, obovate or oblanceolate, coarsely toothed or serrate, acute or obtuse, narrowed at the base, or very broad and almost auricled. Heads few or many, in terminal simple or compound corymbs, often umbellate: involucral bracts purple, narrow, glabrous. Florets yellow, achenes papillose between the five ribs. **t. 286.** Wight Ic. t. 1121.

Nilgiris and Pulneys. Flowers in August and September.

Gynura travancorica *W. W. Smith; Rec. Bot. Sur. Ind.* VI 29. Hispid all over except involucres. Leaves mostly radical, stiffly erect, blade lanceolate acute, narrowed to the base, into a petiole which is slightly broadened at the base, irregularly serrate, densely pubescent on lower surface. Bracts of involucre glabrous, with smell of mango. Flowers orange, achenes strongly ribbed, red or purple with white between the ribs.

In swampy places. Nilgiris at Kodanad. Shevaroys.

G.F.M.P. iii p. 714 gives flowers of G. nitida as orange or G. travancorica as yellow. My collections showed the colours *vice versa*: they probably vary.

EMILIA. F.B.I. LXXVII.

Herbs with alternate leaves and small solitary purple flower-heads, with involucral bracts of the SENECIO type and similar to GYNURA but without small extra bracts below the flower-head, and stylar arms truncate. Pappus hairs long, copious.

Species 4 or 5 in India and tropical Africa.

Emilia scabra *DC.*, formerly Emilia sonchifolia *Wight, Herb. Prop.* 1486; *F.B.I.* iii 336, *as of DC.*, LXXVII 1. A herb, when young with leaves mostly near the ground and short flowering stems; when older, 2 to 3 feet, erect or decumbent, leafy except near the flowers. Radical leaves pinnatifid or lyrate with end lobe largest: upper leaves oblong, stem-clasping, serrate: all more or less scabrid. Heads on long slender stalks, purple. Stylar arms truncate, achenes five-ribbed, hairy on the ribs and papillose between them. **t. 287.** Wight Ic. t. 1123.

The hairy high and smooth low land forms were regarded in F.B.I. as varieties of one species, but *G.F.M.P.* restores DeCandol e's species as distinct.

Very common on the downs. Pulneys and Nilgiris after the summer rains. Shevaroys.

Gen. Dist. Throughout India, Asia and Africa.

Emilia zeylanica *C. B. Clarke; F.B.I.* iii 336, LXXVII 4. *var.* paludosa *Gamble.* Stems or branches to 2 feet, glabrous, slender. Leaves entire, narrow, oblong or oblanceolate; upper one with auricled base. Flower-heads few: bracts $\frac{1}{3}$ by $\frac{1}{16}$ inch, oblong acute. Stylar arms with enlarged tips (cones). Achenes scabrid. **t. 288.** Wight Ic. t. 1123.

Pulneys: on the downs.

Previously known only from Ceylon.

I have been unable to find Clarke's type sheet, but have seen many others named by him at Kew. My achenes are smooth, but perhaps only so because young. The stylar arms are definitely as Clarke describes, and I have no doubt that my Pulney plant is the same species as his from Ceylon.

NOTONIA. F.B.I. LXXVIII.

Succulent herbs or undershrubs with long stalked unrayed flower-heads having involucral bracts of the

SENECIO type (p. 303), and in general similar to GYNURA but the stylar arms oblong.

Species 4 or 5, all Indian.

Notonia Walkeri *C. B. Clarke; F.B.I.* iii 337, LXXVIII 3. A tall herb or shrub, glabrous. Leaves 4 to 8 inches, elliptic, acute at both ends, serrate, with stalk dilated at the base. Corymbs terminating leafless continuations of the stem: the ultimate peduncles with several small bracts below the flower-heads: bracts linear ½ to ¾ inch. Florets all tubular. Achenes five-ribbed, hairy on the ribs. **t. 289.** Wight Ic. t. 1122 as *Gynura.*

Nilgiris: Ootacamund on Club hill. Pulneys. Flowers in summer months.

Notonia Shevaroyensis *Fyson.* Leaves mostly radical, obovate irregularly toothed to nearly entire, fleshy, quite glabrous. Stem leaves few, oblong, the uppermost broad at the base, and passing into bracts at the branches of the inflorescence. Heads 10 to 20, in a loose irregular corymb. Heads ⅓ to ½ inch long and wide. Bracts in one series, with thick green middle part and as broad scarious margin, pubescent towards the tip: a few much smaller outside. Florets all similar, tubular, five-lobed, yellow. Stylar branches ending in enlarged truncate stigmas. Anthers rounded at the base. Achenes cylindrical pubescent: pappus white. **t. 290.**

Shevaroys: in swamps, on "Green Hills"; flr. June to December. Desc. in Journ. Ind. Bot. Soc. XI (1932) i.

In habit and appearance it resembles a Senecio but without rays. The leaves are often violet on the underside.

SENECIO. F.B.I. LXXIX.

Herbs or shrubs, erect or climbing, with alternate leaves and yellow-rayed flower-heads characterized by

the involucral bracts narrow but not attenuate, usually all equal in one circle only to with a few outer smaller and filiform ; anther bases rounded and stylar arms truncate, recurved. Achenes five to ten-ribbed, with copious pappus.

Species about 900 in temperate climates (in the tropics on mountains).

In Europe are several species Groundsel, Ragwort. *Ger.* Kreuzkraut, Kreuzwurz ; *Fr.* Senecon, Jacobée.

KEY TO THE SPECIES.

a
- Erect herbs ; leaves linear to ovate entire, toothed or deeply cut . . . . *b*
- Climbing plants : leaves cordate or hastate . . . . *e*

b
- Leaves all quite entire . . . . *c*
- Lower or all leaves toothed . . . . *d*
- Leaves deeply pinnatifid : small branched plant . . . 8. S. Hokenacheri.

c
- Stem simple ; leaves 1 inch by $\frac{1}{4}$ inch erect close ; the whole a green cylinder, thickest in the middle . . . 3. S. lavendulæ folius.
- Stem simple, slender : leaves evenly on stem $\frac{3}{4}$ inch, lenear. 5. S. Lawsoni.
- Stem branched : leaves 3 to 4 by $\frac{1}{2}$ inch. 1. S. zeylanicus.

d
- Leaves closely serrate, scattered on the stem. In marshes. 4. S. Wightii.
- Ls. lanceolate, distantly toothed . 2. S. Nilgherrianus.
- Ls. mostly near the base ; serrte . . 6. S. polycephalus.
- Ls. very coarsely and deeply toothed . 7. S. Lesingianus.

e
- Ls. cordate, nearly glabrous on both sides. 9. S. Walkeri.
- Leaves cordate, but white or buff-tomentose below . . 10. S. corymbosus.
- Leaves hastate, glabrous or nearly so. 11. S. Wightianus.
- Ls. hastate, but with tomentum below . 12. S. candicars.
- Ls. slightly hairy . . . . 13. S. intermedius.

Erect herbs.

1. **Senecio zeylanicus** *DC.; F.B.I.* iii 340, LXXIX 8; Grassy Ragwort. Distinguished by its very narrow, entire, almost grass-like leaves.

Stem puberous-pubescent, 1 to 3 feet, slender. Lower leaves 4 to 6 by $\frac{1}{8}$ to $\frac{1}{3}$ inch, one-nerved, occasionally toothed; upper narrower. Corymbs 6 inches broad, with slender bracts at the forkings. Heads $\frac{5}{8}$ inch: bracts $\frac{1}{4}$ inch, pubescent, suddenly ending in long points. Achenes black, strongly ribbed, minutely scabrid. Pappus white. **t. 291.**

Pulneys: on the downs.

Gen. Dist. Mountains of Travancore and Ceylon.

2. **Senecio nilgheryanus** *DC.; Wight Herb. Prop.* 1482*!; F.B.I.* iii 341 *as of DC.*, LXXIX 9; Nilgiri Ragwort. Distinguished by its oblong or oblanceolate, very distantly toothed leaves.

Stem shrubby below, nearly glabrous or cottony, ribbed or angled, leafy. Leaves 3 to 5 inches, oblong oblanceolate, from a narrow auricled base, scabrid above, hirsute-tomentose below, acute, distantly toothed, one-nerved. Heads 1 inch, not numerous, in open corymbs: bracts with broad scabrid nerve. Rays spreading. Pappus white. Wight Ic. t. 1132.

Pulney and Nilgiri downs on the margins of sholas. Flowers in summer. Not recorded elsewhere on the Kundahs. The leaves are very white, woolly underneath [*G.F.M.P.*].

3. **Senecio lavandulæfolius** *Wight, Herb. Prop.* 1481*!; F.B.I.* iii 343 as of *DC.*, LXXIX 17. A small erect single stemmed herb distinguished by its closely set erect narrow leaves, the whole leafy part being of a spindle shape.

Stem unbranched, or branched towards the top, 6 to 18 inches erect. Leaves 1 by $\frac{1}{8}$ inch, densely imbricate, oblong, acute, erect from a broad base, one-nerved,

villous above, tomentose underneath ; marginally slightly recurved : upper and lower leaves shorter. Corymb terminal-stalked above the uppermost leaf. Bracts many, imbricate, pubescent. Pappus white. **t. 292.** Wight Ic. t. 1133.

On the open grass downs of both plateaus. Nilgiris : flowering December. Pulneys : flowering September.

In figure 292 : *a.* central floret with stamens but no style ; *b.* disc floret with stamens and style ; *c.* ray floret with style only ; *d.* involucre after flowering with inner bracts spread showing receptacle pitted ; *e.* ripened achene of hermaphrodite floret *b* ; *f.* unfertilized ovary of *a* or *c.* [*E.T.B.*].

4. **Senecio Wighti** *Benth.*, formerly S. Saxatilis *Wall.* ; *F.B.I.* iii 344, LXXIX 20 ; Swamp Ragwort. Stem at the base, or perennial root-stock, decumbent, sometimes long and creeping, not as a rule branching below the flowering part. Leaves oblanceolate, serrate, acute, with auricled base ; the lower about 2½ by ½ inch, the upper smaller. Branches of the corymb slender, with linear bracts of ⅛ to ¼ inch, not only at the forkings but also scattered on the branches and peduncles. Heads ¾ inch. Involucral bracts about sixteen linear, often purple or brown. Rays ¼ by 1/12 inch, yellow. Achenes slender as long as or longer than the scabrid pappus. **t. 293.** Wight Ic. t. 1124 (Doronicum wightii).

Nilgiris : in swamps. On the downs, Mukarte, etc.

Gen. Dist. Also Khasi.

5. **Senecio Lawsoni** *Gamble ; Kew Bull.* 1920, *p.* 342. A very slender herb, 12 to 15 inches high. Leaves scattered along the stem regularly from base to inflorescence, linear, up to ¾ inch long, villous only on the midrib. Corymbs somewhat lax with few heads. Bracts scarious on the margin. Ray florets 5 to 7 veined.

Nilgiris : Kundahs at about 7,500 feet, on grassy downs between Avalanche and Sispara ; flowering November [*G.F.M.P.*].

6. **Senecio polycephalus** *Clarke ; F.B.I.* iii 344, LXXIX 22. Stem at base creeping or a slender rhizome, above branched or not below the flowering part. Whole plant covered with scattered hairs. Leaves mostly near the base ; these about 2 by 1 inch, elliptic regularly crenate-serrate, with rather thickened margin and hairs from bulbous bases : upper leaves oblong, $1\frac{1}{2}$ by $\frac{1}{4}$ inch with auricled base, diminishing upwards into bracts. Heads few, 1 inch across : branches of corymb, with several linear bracts, especially near the heads. Involucral bracts ten to fifteen, $\frac{1}{5}$ inch long, linear oblong acuminate, glabrous or pubescent. Rays eight to ten, very broadly oblong, equal to the involucral bracts. Achenes slender, $\frac{1}{6}$ inch, nearly as long as to the red pappus. **t. 294**. Wight Ic. t. 1124.

Nilgiris : on the downs ; slope of Snowdon ; flowering September. Shevaroys : (leaves nearly entire).

7. **Senecio Lesingianus** *C. B. Clarke ; F.B.I.* iii 344, LXXIX 23. Leaves all on the stem, the upper smaller, the lower close, sessile elliptic or oblong 2 by $\frac{3}{4}$ inch, deeply and coarsely toothed. Heads few on long peduncles. Bracts narrow, hispid. Rays of head broad, 9 veined, Achenes hispid.

Nilgiris : hills above 6,000 feet on western border above Naduvattum, etc.; flower September.

8. **Senecio Hohenacheri** *Hook. f ; F.B.I.* iii 345, LXXIX 25. A small herb, stem and branches slender, sometimes only 3 inches. Leaves deeply pinnatifid into narrow segments. Heads $\frac{1}{2}$ to $\frac{3}{4}$ inch diameter. **t. 295**.

In dry pastures on lower levels, e.g., Biccapatti and below Shevaroys. Horsleykonda. It passes at lower levels into S. tennuifolius *Benn.* and some even of these high-level plants are indistinguishable from that species.

* * *Climbing plants.*

9. **Senecio Walkeri** *Arn.*, formerly S. aranoseus *DC.; F.B.I.* iii 351, LXXIX 44. A climber; stem slender, finely grooved. Leaves stalked, ovate to circular, acute, cordate 2 to 3 inches diameter with small distant teeth, glabrous or cottony. Flower-heads in axillary or terminal rounded panicles: involucral bracts about eight, $\frac{3}{16}$ inch long, linear with thick middle band and paler margins. Achenes $\frac{1}{8}$ to $\frac{1}{6}$ inch: pappus $\frac{1}{4}$ to $\frac{3}{8}$ inch. Wight Ic. t. 1131.

In sholas on both plateaus, flowering during the early months of the year. Nilgiris: Ootacamund to Coonoor. Pulneys: near Kodaikanal and down to Shembaganur.

10. **Senecio corymbosus** *Wall., Cat.* 3121 *! ; F.B.I.* iii 351, LXXIX 45. A climber similar to the last but leaves white-tomentose underneath. Stem zigzag, slender, ribbed but not angled, cottony. No stipules. Leaf-stalks 1 inch: blade 1 to 2 inches; underside covered with dense white tomentum; upperside glabrous except for an easily removed cotton, drying black. Flower-heads numerous, in terminal or axillary peduncled rounded panicles, with very tomentose branches: Wight Ic. t. 1130.

Nilgiris: on the downs and eastern plateau down to Pykara and Kodanad. Flowers from December to March. Pulneys: Kodaikanal, etc.

I have seen glabrous and cottony or tomentose leaves in different parts of the same plant and therefore consider these last two really one species.

11. **Senecio Wightianus** *DC.; Herb. Wight Prop.* 1480 !, including S. intermedius *Wight; F.B.I. under* S. scandens *Don*, iii 352; LXXIX 47.** A slender weak-stemmed plant climbing or growing gregariously in clumps or bushes 3 to 4 feet high and more wide, with stalked hastate toothed leaves, not white below, and terminal corymbs of small flower-heads.

Stem slender, strongly (about ten) ribbed. Stipules semi-lunar, $\frac{1}{6}$ to $\frac{1}{4}$ inch. Leaves simple or of three leaflets : stalk $\frac{1}{3}$ to $\frac{1}{2}$ inch. Lateral leaflets if present opposite, $\frac{1}{2}$ by $\frac{1}{2}$ inch, obovate deltoid or oblanceolate ; terminal leaflet triangular or hastate, $1\frac{1}{2}$ to 2 by $\frac{1}{2}$ to 1 inch (at base), sharply and irregularly dentate, glabrous on the upper side, pubescent on the under. Corymbs on axillary branches, ten to twenty-flowered : bracts $\frac{1}{8}$ inch linear. Heads $\frac{1}{2}$ inch : involucral bracts slender. Achenes $\frac{1}{16}$ inch. **t. 296.** Wight Ic. tt. 1135 and 1136.

Nilgiris and Pulneys : on the downs ; flowering from September to March.

Gen. Dist. Also Ceylon. Wight Kew Dist. 1649, 1650, Hohenacker 1353, Gardner.

S. scandens *Don.*, with which this is united by Hooker in F.B.I., is a Nepal plant with larger stipules and larger flower-heads, and appears to me different Clarke, however, in his *Compositæ of India*, with MS. revision, united S. candicans *DC.* also under S. scandens *Don.* Whether these are all to be considered one species or two or three must largely be a matter of individual opinion, but the name *scandens* for an Indian SENECIO cannot stand since Thunbergh had already given it to a South African species, as Cacalia scandens *Thunb.* in his *Plantarum Capensium*, first edition, 1794. Don's *Prodromus Nepalensis* was published in 1825.

12. **Senecio candicans** *DC., Wall. Cat.* 3123 ! ; *F.B.I.* iii 352, LXXIX 48. A climber : whole plant whitish with close or loose tomentum. Stems, zigzag, five-angled and ribbed. Stipules $\frac{1}{4}$ inch, prominent, roundish or ear-shaped. Leaf-stalk $\frac{1}{4}$ inch : blade $1\frac{1}{4}$ to 2 by $\frac{1}{2}$ to 1 inch, hastate or triangular with cordate base, acuminate, serrate. Corymbs terminal. Bracts $\frac{1}{4}$ inch whitish. Ray florets few. Achenes pubescent. Wight Ic. t. 1134.

Nilgiris : near Ootacamund and down to lower levels, common ; flowering December. Pulneys : Kodaikanal, etc. ; flowering July.

13. **Senecio intermedius** *Wt., F.B.I.* iii 352 as S. scandens similar in general habit to the last two, and

intermediate in the hairiness of the leaves ; belongs to lower levels than the Shevaroy plateau, e.g., Horsleykonda, but occurs on the Kundahs at 7,000 feet [*G.F.M.P.*].

CNICUS. F.B.I. 78 LXXXVII.

Thistle.

Erect herbs with spiny and spine-toothed leaves often decurrent down the stem, and spiny involucral bracts. Florets all tubular and similar. Anther cells with slender tails. Achenes with feathery pappus.

Species about 150, in all north temperate climates.

Cnicus Wallichii *DC. ; F.B.I.* iii 363, LXXXVII 7 ; common Indian Thistle. Stem 3 to 5 feet, ribbed, cottony. Leaves sessile, stem-clasping ; lower deeply pinnatisect, upper sinuate-pinnatifid : the segments irregularly lobed and toothed, and margin all round armed with numerous long slender spines. Heads terminal on short axillary leafy branches, forming a terminal corymbose panicle. Outer involucral bracts very spiny, inner dilated just below the tip and incurved there. Florets purple. Pappus white, feathery. **t. 297.** Wight Ic. tt. 1137-8.

On the open downs. Pulneys. Flowers in June. Nilgiris.

Gen. Dist. Himalayas of Sikkim, Nepal and Bhutan.

PICRIS. F.B.I. 78 CVII.

Oxtongue.

Herbs with hispid stem, alternate or radical leaves, and few, long stalked, yellow flower-heads of the CICHORIACEÆ type (p. 303) (all florets ligulate and similar), and characterized by the involucre composed of a set of narrow scarious inner bracts in one circle, with several shorter outer bracts ; achenes with five to ten rough ribs ; and pappus hairs, feathery and copious.

Species about 24, Europe, North Africa, northern Asia ; and one cosmopolitan.

Picris hieracioides *Linn.; F.B.I.* iii 392, CVII; Hawkweed Oxtongue. Stem rough with stiff hairs. Leaves oblong, stem-clasping, 3 to 8 by 1 to 1½ inches, sinuate-toothed, very scabrid on the margin and midrib underneath. Heads often in pairs on a long common peduncle, with a few linear bracts on the pedicels. Bracts all scabrid with a single or double row of stiff black hairs down the middle. Florets orange-yellow. Achenes ⅙ inch, pointed at each end, slightly curved, ribbed and cross-ribbed : pappus white. **t. 298.** Wight Ic. t. 1143. Ill. to Bentham's Brit. Flora by Fitch and Smith No. 581.

On the open downs. Pulneys and Nilgiris. Flowers from May to January.

Gen. Dist. Temperate climates of the Old World.

CREPIS. F.B.I. CVIII.

Hawksbeard.

Herbs with the leaves mostly from near the ground, or if on the stem alternate and clasping the axis with ear-like bases. Florets yellow, all strap-shaped, five-toothed. Involucres narrow, cylindrical or enlarged at the base, of two series of bracts ; the outer short, the inner much longer and after the flowering is over with thickened and hardened midrib : receptacle naked. Anthers pointed at the base. Stylar arms slender. Achenes ten to thirty-ribbed (not compressed as in SONCHUS and LACTUCA and contracted just below the summit, crowned by a pappus of very white, fine hairs.

As defined in *Gen. Plant.*, species about 130 scattered over the northern hemisphere, mostly of the Old World ; in America fewer, and very few in the tropics and south of the Line.

KEY TO THE SPECIES.

Stem up to 18 inches, much branched below the flowers ; heads $\frac{1}{4}$ inch or less ; achenes with many ribs. . . C. japonica.
Flowering stem less than a foot high, not branched ; heads 1 inch ; achenes with six thick ribs . . . . C. acaulis.
Stem very slender, leaves acuminate . . . . . C. fuscipappa.

Crepis japonica *Benth.* ; *F.B.I.* III 395, CVIII 6 ; Japanese Hawksbeard. Leaves nearly all near the ground, sinuate-pinnatifid or lyrate, with minute spiny teeth. Flowering stems several, erect, nearly leafless, 1 to 2 feet, slender, branched upwards so that the heads are in a loose panicle. Involucres $\frac{1}{8}$ inch across : bracts $\frac{1}{6}$ inch long, linear. Achenes $\frac{1}{10}$ inch, ellipsoid, strongly ribbed, brown. Wight Ic. t. 1147. **t. 299.**

In shady places, e.g., woods. Pulneys : in and near Kodaikanal, flowering June. Nilgiris : commoner at lower levels.

Gen. Dist. South-east Asia on mountains from Afghanistan to Ceylon, eastwards through the Malay Peninsula to China and Japan, and westwards to Mauritius.

Crepis fuscipappa *Benth* : *F.B.I.* iii 395, CVIII 7 ; A slender usually unbranched herb, with narrow long-acuminate leaves.

Nilgiris : Avalanche and Sispara [*G.F.M.P.*].

Gen. Dist. Sikkim, Himalayas and southwards to Ceylon.

Crepis acaulis *Hooker f.* ; *F.B.I.* iii 396, CVIII 8 ; Little Hawkweed. A small herb common in the grass of the open downs, with solitary yellow flower-heads which appear after the first showers.

Rootstock perennial, as thick as a lead pencil. Leaves mostly radical, 2 to 4 inches, oblanceolate, with sheathing base ; the margin with small close, backward-pointing red teeth ; blotched often with purple on both sides, quite glabrous. Flowering stem shorter or longer than the leaves, sparingly branched. Heads few, 1 to $1\frac{1}{4}$

nches, broad. Bracts of the involucre few, with thin purplish margins ; the three outer ones about half as long as the five or six inner. Florets seven or eight, all strap-shaped, five-toothed, the upper side pale yellow. Anthers fully exserted above the mouth, sagittate. Branches of the style slender, $\frac{1}{2}$ inch, hairy all along the outer side. Pappus very white, achenes contracted just below the top. **t. 300.** Wight Sp. Nilg. t. 118 ; Ic. t. 1145.

On the open grass land. Nilgiris : common at Pykara, Bikkapatti (6,700 feet) and above.

The flowers open about 10 a.m., and close before 4 o'clock. I adopt the name Hawkweed rather than Hawksbeard for this species, though the true Hawkweeds (Hieracium) are distinguished by the bracts of the involucre remaining unaltered after flowering, the achenes not being contracted below the pappus, and in other details, because this species is much more like in habit and general appearance the Mouseear and Alpine Hawkweeds of England than to any British species of Crepis.

HYPOCHÆRIS. F.B.I. 78 CXI.*

Catsear.

Annual (or perennial) herbs with leaves all near the ground and heads borne singly on nearly leafless simple or branched flower-stems (scapes). Involucral bracts in two or three rows, the outer short, the inner longer. Florets all ligulate and similar, yellow. Receptacle with scales between them. Achenes slender with ten ribs and also cross-wrinkles and those of the outer florets prolonged into a beak, bearing the pappus. Pappus hairs feathery.

Species about 3 in temperate climates.

Hypochæris glabra *Linn.* ; *F.B.I.* iii 401, CXI 1 ; Leaves subsessile, obovate or oblanceolate, deeply sinuate-toothed. Flower stems a foot or more simple or occasionally forked, thickened at the top, and with a few small bracts. Heads $\frac{2}{3}$ inch. Outer bracts of involucre short ;

inner lengthening in fruit to $\frac{5}{8}$ by $\frac{1}{8}$ inch. Florets yellow. Achenes dark brown finely ribbed and wrinkled ; those of the outer florets $\frac{1}{6}$ inch, truncate, those of the inner narrowed to a short beak bearing the pappus. **t. 301.**

A weed on roadsides in Ootacamund, flowering December. Native of Europe.

TARAXACUM. F.B.I. 78 CXII.

Dandelion.

Herbs with milky juice, perennial rootstock, and leaves all radical, and characterized by the flower-heads on tall leafless stalks (scapes) rising straight from the rootstock ; the involucres of an inner single circle of erect bracts which do not change after flowering with several outer often recurved bracts ; and the achenes extended upwards in a long beak bearing the pappus hairs which spread out horizontally like a flat umbrella.

Florets all similar and fertile, ligulate, with five teeth anther-cells with long tails : stylar arms slender.

Species about 10, in temperate and cold regions.

Taraxacum officinale *Linn. ; F.B.I.* iii 401, CXII 1 ; common Dandelion. Rootstock strong, vertical, Leaves all radical pinnatisect, with backward sloping segments ; margins with small spine-teeth. Heads solitary on hollow scapes of about 6 inches : inner bracts erect $\frac{3}{4}$ inch. Florets yellow. Achenes $\frac{1}{3}$ inch, egg-shaped, the upper and broader end armed with teeth and prolonged into a beak $\frac{1}{5}$ inch long. Pappus hairs feathery.

As a weed. Kodaikanal.

Hooker in F.B.I. observes that it is remarkable that this plant, so common in the Himalayas, should not be found on the Khasi and Nilgir mountains, even as a garden-escape. I have seen it only as a weed.

LACTUCA. F.B.I. 78 CXIV.

Herbs with milky juice and narrow heads of yellow blue or white ligulate florets, with thin involucral bracts,

no scales between the florets, and achenes narrowed upwards into a beak which ends in a small disc carrying the very soft white pappus of simple hairs.

Species about 60 in the north temperate regions.

Lactuca hastata *DC.*; *F.B.I.* iii 407, CXIV 14; Stem tall, 2 to 7 feet, glabrous or roughened or sticky. Leaves 4 to 12 inches, variable in shape; usually with a narrow-stalk part extended in occasional lobes and widened to clasp the stem at its base, and a broad terminal heart-shaped part, with small sinuate-teeth. Heads several in irregular racemes or branches at the end of the stem, in the axils of narrow bracts $\frac{1}{6}$ inch wide and 1 inch or more long. Involucre of several rows of bracts about $\frac{1}{2}$ inch. Florets bluish-purple. Achenes $\frac{1}{4}$ inch including the beak, flat, irregularly ribbed, suddenly contracted into a brown cleft tip in which the white beak is situated. Pappus $\frac{1}{4}$ inch dirty white with an outer ring of bristles. **t. 302.**

Nilgiris: Forester's hut near Ootacamund.

Gen. Dist. Also temperate Himalayas and Khasi hills.

SONCHUS. F.B.I. 78 CXVII.

Sowthistle.

Leafy herbs with milky juice and radical, or alternate and then stem-clasping leaves, and irregular umbels or corymbs of yellow flower-heads, often broadest at the base, of the CICHORIACEÆ type (p. 303) (all florets ligulate and similar), on a flat receptacle, and characterized by the ribbed obovoid or ellipsoid compressed achenes, without beaks, and the long slender pappus hairs united at the base and falling off together.

Species 24 in the north temperate regions and central Asia; a few spread as weeds all over the world.

Sonchus arvensis *Linn.; F.B.I.* iii 414, CXVII 2; Corn Sowthistle. Stem $1\frac{1}{2}$ to 2 feet with perennial rootstock. Radical leaves deeply pinnatisect, the terminal and each pair of lateral leaflets forming broad triangles with almost horizontal base; margin finely sinuate-spine-toothed: upper leaves lanceolate, broadest at the deeply cordate stem-clasping base. Flower-heads 1 inch, in an irregular umbel: involucral bracts glabrous $\frac{1}{2}$ inch. Achenes dark brown, ribbed and cross-striated, blunt above, tapering below; pappus silky. Wight Ic. t. 1142.

Ootacamund as a weed. Flowers in cold months. Pulneys: at lower levels.

Gen. Dist. Wild and a weed of cultivation in all temperate and many tropical countries.

CAMPANULACEÆ.

Herbs with alternate leaves. Flowers monopetalous with an inferior ovary typically of three cells and style with three stigmas, rather long persistent sepals, stamens attached at the base to the corolla, and very numerous small seeds with erect embryo in endosperm.

Species about 1,000, all over the world.

Tribe I: LOBELIEÆ—Corolla irregular, two-lipped, and split down the back to the base: anthers united but filaments free (as in COMPOSITÆ). Ovary two-celled.

Fruit a capsule: tall herbs with dense spike of flowers, or small herbs . . . . LOBELIA.

Tribe II: CAMPANULEÆ—Corolla regular: anthers not connected, ovary three-celled.

Capsule opening inside the calyx teeth: stem very slender. Flowers bell-shaped . . . . WAHLENBERGIA.

Ditto, but flowers flat, star-like . . . . . . CEPHALOSTIGMA.

Capsule opening by slits at the side, below and between the calyx teeth: stem erect or spreading . . . . CAMPANULA.

LOBELIA. F.B.I. II.

Corolla two-lipped; upper lip split down the back; lower three-lobed spreading. Herbs tall or quite low, with alternate usually toothed leaves. Flowers solitary in the axils of leaves or of bracts, and then often in a dense terminal spike. Stamens five, anthers connate, the two upper (dorsal) tipped with bristles, the three lower naked. Ovary inferior, two-celled, surmounted by three long sepals: style single, with bifid stigma. Fruit a capsule opening in two valves between the calyx teeth.

Species 200, in temperate and sub-tropical regions.

Lobelia trigona *Roxb.; F.B.I.* iii 423, II 1. A small delicate herb similar to the common blue Lobelia of gardens.

Stem 5 to 12 inches. Leaves $\frac{1}{4}$ to $\frac{3}{4}$ inch, broadly ovate, crenate-serrate, very shortly stalked. Flowers on slender axillary pedicels of 1 inch. Calyx tube $\frac{1}{8}$ inch; teeth slightly longer, linear. Corolla twice as long, blue, with unequal lobes. Anthers all tipped with a minute fringe of hairs. Capsule $\frac{1}{6}$ to $\frac{1}{4}$ inch, ellipsoid. **t. 303.**

Belongs properly to lower levels, e.g., Courtallam and Mysore, but occurs on the Nilgiri plateau near Coonoor and Pykara in marshy ground. Pulneys: below Kodaikanal. Shevaroys.

Gen. Dist. South India from sea level upwards to 6,000 feet and over, Assam, Bengal, Ceylon, Burma.

Lobelia excelsa *Lesch.; F.B.I.* iii 427, II 15; Giant Lobelia. Tall coarse herbs, stem usually simple. Leaves oblanceolate obovate or elliptic, very large at the base, smaller above, soft, finely toothed. Flowers in a dense purplish brown spike, 12 inches by $1\frac{1}{2}$ to 3 inches. Calyx tube campanulate, $\frac{1}{6}$ inch, tomentose; sepals $\frac{5}{8}$ inch, narrow acute. Corolla about twice as long, split down the

back, so that it falls down exposing the stamens. Filaments twice as long as the sepals: anthers $\frac{3}{10}$ inch, oblong, glabrous. Fruit globular, enclosed in the calyx tube. t. 304. Wight Ic. t. 1172.

At high levels round sholas, etc. Nilgiris: Ootacamund. Pulneys: Kodaikanal and above.

Gen. Dist. Mountains of South India. The Giant Lobelias occur on tropical mountains in Asia and Africa.

Lobelia nicotianæfolia *Heyne ; F.B.I.* iii 427, II 14. Very similar to the last, but the leaves thinner and less hairy, the spikes looser and the flowers larger and white, and anthers with a few long hairs on the backs.

Nilgiris and Pulneys at rather lower levels than the last, e.g., Shembaganur.

Var. tricantha—spike slender, branched, anthers with white hairs. In similar situations.

CEPHALOSTIGMA. F.B.I. 80 III.

Small herbs with alternate mostly waved leaves and small star-shaped flowers on very slender pedicels in racemes like cymes or panicles with pointed bracts, style three-lobed. Fruit a capsule.

A very small genus of about 10 species.

Cephalostigma Schimperi *Hochst. ; F.B.I.* iii 428, III 1. Herb 10 to 15 inches high, all covered thinly with spreading hairs. Leaves $\frac{3}{4}$ inch, narrow. Flowers $\frac{1}{8}$ to $\frac{1}{6}$ inch diameter, bluish.

Shevaroys: on plateau; flower January. Horsleykonda and at lower levels.

WAHLENBERGIA. F.B.I. IV.

Flowers of the CAMPANULA type, i.e., the corolla quite regular, bell-shaped with five lobes, style with three stigmas and anthers free; but differing in the capsule opening at the top, inside the sepals.

Species 100, mostly in the southern hemisphere, e.g., south and tropical Africa, Madagascar, tropical and eastern Asia, Australia, New Zealand, western Europe.

Wahlenbergia gracilis *DC.; F.B.I.* iii 429, IV 1. Stems several from a horizontal perennial rootstock, flexible, 2 to 12 inches. Leaves ¼ to 1 inch, mostly narrow, linear or lanceolate to obovate-oblong, distantly and minutely toothed, strongly one-nerved. Flower-stalks terminal, 1 to 6 inches, naked or with one or more bracts and aborted buds. Calyx tube $\frac{1}{12}$ inch, campanulate; sepals longer, acute, glabrous. Corolla bell-shaped, about ½ inch, mauve-blue, divided nearly one-third way down into five broad lobes. Stigma three-lobed. Capsule ¼ inch, egg-shaped, tapering to the stalk, opening by three valves inside the sepals. **t. 305.** Wight ec. t. 1175, Sp. Nilg. 124.

In the grass of the open downs, very common; flowering after the first April showers. Pulneys: near and above Kodaikanal. Nilgiris: Ootacamund to Pykara and Coonoor.

The leaves vary in shape and hairiness.

CAMPANULA.

Herbs with perennial rootstock, rarely annuals. Corolla bell-shaped, lobed. Ovary usually three-celled, and stigma three-lobed. Anthers not united. Capsule inferior crowned by the dried sepals and opening at the sides by slits between the ribs of the "calyx tube."

Species about 200, mostly in the temperate regions of the northern hemisphere; also Mediterranean, Arabia and tropical Africa and Asia (on mountains).

Campanula ramulosa *Wall.*; formerly included in C. colorata *Wall.; F.B.I.* iii 440, XIII 5. Stem coarsely hairy, $\frac{1}{12}$ to ⅛ inch thick, solitary, or several from a perennial rootstock, erect or spreading. Leaves well

separated up to 1 inch, obovate acute, crenate-serrate, hispid, especially on the underside. Flowers terminating the main stem and on axillary branches, forming a broad irregular panicle. Calyx tube $\frac{1}{8}$ inch; sepals as long, triangular. Corolla $\frac{1}{2}$ inch, blue, lobed about one-third. Anthers long, attached lightly at their bases. Calyx tube in fruit $\frac{1}{4}$ inch, hemispheric with proportionately enlarged sepals. **t. 306.**

In the grass of the open downs; flowering from May to August. Pulneys: 7,000 feet and above. Nilgiris: on the downs.

I divide the species C. colorata *Wall.* of my first edition as it is divided in G.F.M.P., but I see no real difference between these plants. The species C. colorata *C.B. Clarke* was founded on a Himalayan plant. When doing the former work at Kew, I could find no difference between my Pulney and the Thibetan examples.

Campanula Wightii *Gamble* (*G.F.M.P., p.* 740). Similar to the last but branches from the thick rootstock; many slender leaves mostly under $\frac{1}{2}$ inch; calyx scarcely $\frac{1}{10}$ inch. Flowers purple or often without petals or stamens. Wt. Ic. b. 1178 and Sp. Nilg. t. 176.

Nilgiris and Pulneys on the downs.

Campanula Alphonsii *Wall., Cat.* 1296 *! ; F.B.I.* iii 440, XIII 6. Stems slender, much tufted, weak and spreading. Leaves $\frac{1}{4}$ to $\frac{1}{2}$ inch, obovate, narrowed to the nearly sessile base, white below, with a few rounded teeth. Flowers mostly terminal, and a few pedicelled in the upper axils. Corolla bell-shaped, $\frac{3}{4}$ to $\frac{1}{2}$ inch, blue or purple. **t. 307.** Wight Sp. Nilg. t. 125, Ic. t. 1177.

On the downs, Pulneys and Nilgiris. *Bourne* 283, 1578.

Leaves similar in some respects to C. colorata, but more closely set and all facing upwards on the horizontal stems. The flowering part, too, not corymbosely branched. Not reported elsewhere.

Campanula fulgens *Wall., Cat.* 1283 *! ; F.B.I.* iii 442, XIII 13. Remarkable for the flowers being in groups at irregular intervals along the spike.

Stem erect, 1 to 3 feet, and about $\frac{1}{8}$ inch thick, ribbed, little, if at all, branched. Leaves crowded near the ground, distant higher up, 2 to $3\frac{1}{2}$ by $\frac{1}{2}$ to 1 inch, elliptic, narrowed at both ends, coarsely crenate-serrate, softly pubescent on the upper side, roughly hairy on the under. Spikes terminal. Flowers solitary or in bunches of two or three at intervals of $\frac{1}{2}$ to 2 inches, subsessile, the top flower opening first. Bracts linear $\frac{3}{8}$ inch. Calyx tube conical $\frac{1}{8}$ inch; sepals linear $\frac{3}{8}$ inch. Corolla blue $\frac{5}{8}$ inch, very deeply divided into five oblong rounded lobes. Anthers narrow, basifixed on slender filaments with broad bases. Ovary enclosed in the ten-ribbed calyx tube, five-celled: placentas stalked from the inner angles and bearing numerous ovules. **t. 308.** Wight Sp. Nilg. t. 127; Ic. t. 1179; Ill. t. 136.

In the grass of the open downs, flowering from May to September. Pulneys: about and above Kodaikanal abundant. Nilgiris: Dodabetta and the downs. Shevaroys: flower January.

Gen. Dist. Nilgiri, Pulney and Coorg mountains up to 8,000 feet, Khaşia, Nepal Sikkim (7,000 feet), Chembi valley, Burma (4,000 feet).

The opening of the topmost flower first and of the others later, in order from the base, is peculiar. It suggests a condensation in time of what one finds with some garden Campanulas, where after the first lot of flowers have withered, or perhaps before the top one which naturally opens last, a second crop appears in twos and threes at the nodes of the older fallen ones. If these latter (i.e., the first set) failed to appear at all, except the top one, we should get what we find in C. fulgens.

VACCINIACEÆ.

Shrubs and trees with alternate, exstipulate, toothed leaves and regular monopetalous flowers characterized by their great regularity, all parts being in fives—five sepals, five corolla lobes, ten stamens, five cells to the ovary; by the stamens being quite free of the corolla

(unusual in *monopetalæ*) ; by the anthers opening by pores sometimes at the end of tubular extensions ; and by the inferior ovary (distinction from ERICACEÆ).

Species 350, in temperate and cold regions.

VACCINIUM. F.B.I. 81 III.

Shrubs and trees with alternate ovate or lanceolate leaves and small flowers in terminal or axillary racemes or bunches. Corolla (in Indian species) egg-shaped with five small teeth. Anthers ten, prolonged upwards in two slender tubes with terminal slits or spurs. Fruit, a globose berry crowned by the calyx teeth, and containing five or more seeds with firm smooth coat.

Species 100, in northern hemisphere and mountains of the tropics.

In Britain 4 species—Whortleberry, Bilberry, Cowberry, Cranberry, etc. *Fr.* Airelle. *Ger.* Blanebeere, Heidelbeere.

Vaccinium Leschenaultii *Wight ; F.B.I.* iii 455, III 17. A fair-sized tree, with thick rough bark. Young parts pubescent, and young leaves pinkish. Leaves 2 to 3 inches by $\frac{3}{4}$ to 1 inch, alternate, erect and curving outwards, elliptic, acute at both ends, crenate, hard, shining ; stalks $\frac{1}{6}$ to $\frac{1}{4}$ inch. Flowers in pubescent racemes, terminal and in the upper leaf-axils pink and white. Calyx $\frac{1}{8}$ inch, its five teeth triangular, ciliate, $\frac{1}{3}$ inch. Anthers as long, produced in two long white tubes of $\frac{1}{8}$ inch, filaments hairy. Ovary covered by a green, ten-lobed disk : style rising from its centre and jointed to it, white with small punctuate stigma. Fruit a berry, $\frac{1}{4}$ to $\frac{1}{2}$ inch, pink to purple when ripe. Seeds light brown $\frac{1}{30}$ inch finely wrinkled. **t. 309**. Wight Sp. Nilg. t. 128 ; Ic. t. 1188. Beddome Fl. Syl. S. Ind. t. CCVII.

Nilgiris : abundant on the plateau, near and in Ootacamund, flowering in winter and spring months, fruiting in summer.

Pulneys : in sholas at and above Kodaikanal, common. The young leaves are purple and in April and May are very conspicuous over the shola.

Gen. Dist. South Indian mountains and Ceylon. Some Nilgiri specimens have nearly round leaves.

Vaccinium nilgherrense *Wight ; F.B.I.* iii 454, III 16. A large shrub, with much narrower and longer leaves (2 to 4 inches by ½ inch), finely crenate, and slightly smaller white flowers and red berries. Filaments of stamens nearly or quite glabrous tubular, beaks of anthers $\frac{1}{16}$ inch. **t. 310.**

At lower levels. Nilgiris : Pykara river below the falls Pulneys : Shembaganur. Shevaroys : Green Hills, flower June.

ERICACEÆ. F.B.I. 82.

Shrubs and trees with alternate or falsely whorled leaves, and perfectly regular flowers with five sepals ; a five-lobed monopetalous corolla ; ten stamens, with anther cells opening at the apex ; a five-celled superior ovary, and dry capsular fruit. (Distinguished from the VACCINIACEÆ in the last two respects.)

Species about 1,000, in all parts of the world, comprising plants of such different habit as *Rhododendron* and *Azalea*, developed chiefly on the mountains of western Asia, and *Erica* (Heather, Heath, Ling) a genus adapted by the small, often narrow and inrolled leaves to dry conditions and occurring exclusively in Europe and the Cape region of South Africa.

In Europe *Menzesia*, *Andromeda*, *Arbutus* (Strawberry tree) and *Arctostaphylos* (Bearberry), *Pyrola* (Winter green) and *Monotropa* (Birds-nest) belong to this or a very closely allied family.

Shrub, flowers $\frac{1}{6}$ inch, egg-shaped, white, in racemes . . . GAULTHERIA.

Tree, flower 1 to 2 inches, bell-shaped, red . . . RHODODENDRON.

GAULTHERIA. F.B.I. 82 I.

Shrubs with persistent alternate serrulate leaves and small flowers in racemes or solitary, with bract and bracteoles. Calyx egg-shaped, persistent as a fleshy coating round the fruit. Corolla long egg-shaped, with five small recurved lobes. Stamens ten ; filaments broad, hairy ; anther cells produced upwards into tubes and horned behind (or in some flowers smaller and without these). Ovary of five cells with many ovules in each ; capsule loculicidal.

Species 90, mostly American.

Gaultheria fragrantissima *Wallich ; F.B.I.* iii 457, I 4. A shrub with stiffy erect twigs and leaves, smelling strongly of Oil of Wintergreen when crushed, and axillary racemes of small snow-white, heather-shaped flowers or dark-blue berries.

Young shoots smooth, often red, angular or compressed. Leaves very hard and stiff, erect or spreading ; stalks thick, red ; blade ovate, rounded at the base, crenate with small points from base to apex, and ending in a short blunt point ; midrib stout ; veins impressed on the upper side ; upper surface glossy ; under light-coloured, dotted with black or brown glands. Corolla egg-shaped, more or less five-angled, $\frac{1}{6}$ inch long with minute teeth ; fragrant. Anthers $\frac{1}{20}$ inch, brown, attached by their backs, flask-shaped and narrowed upwards, ending in four tubes, and opening outwards by slits near the top. Ovary ten-lobed ; style straight ; stigma minute, terminal. Berry $\frac{1}{3}$ inch, blue with red stalk, impressed at the top with five radiating marks, edible. **t. 311.** Wight Sp. Nilg. t. 130 ; t. 1195.

Very common round sholas, in thickets and on the open downs. Pulneys: abundant near Kodaikanal, flowering before the summer. Nilgiris abundant; Ootacamund and on the downs to Pykara and Coonoor flowering early, and fruiting in May and June.

Gen. Dist. Himalayas from Nepal westwards; mountains of Burma, South India and Ceylon.

The fruit is more like a minute apple than an ordinary berry, for the seeds are not immersed in the flesh but enclosed in the cells of the ovary separate from the flesh outside them.

Honey is secreted round the base of the ovary and held in by the ten little pockets between it and the stamens, and prevented from flowing out by the enlargements of the filaments. The anthers swing easily on their filaments, and their horns touch the inside of the corolla. They open outwards and any pollen that may be set free is caught by the hairs on the inside of the corolla, which are directed towards the base (i.e., upwards as the flower hangs) and thereby prevented from falling out. The honey can be obtained only by an insect clever enough to hang on the flower and probe upwards. The narrow entrance to the flower would cause the proboscis to touch the style first and leave on the cup-shaped stigma any pollen it might bring. The proboscis would then curve round the ovary and against the corolla and so come into contact with the horns of a stamen and shake pollen out of the anther on to it.

RHODODENDRON.

This genus includes both the Rhododendrons and the Azaleas of English gardens; the former with evergreen leaves and flowers in close bunches, the latter with annual leaves and more scattered flowers.

Shrubs and small trees with alternate often leathery leaves and large winter buds. Flowers regular or nearly so. Corolla five-lobed. Stamens ten, not attached to the corolla. Ovary five to twenty-celled with single style and capitate stigma, which like the stamens is slightly bent upwards. Fruit a woody capsule, opening from the top downwards into its component carpels but leaving a central axis. Seeds many and small.

Species about 300, with numerous natural varieties: and now, in cultivation, many hybrids and garden varieties. For the most part natives of the region between southern China and

the south-west Himalayas, but extending also to Japan, the islands north of it, and North America, on the one side ; and on the other to the Caucasus and southern Europe (4 sp.). North Australia has one species and South India one.

The Rhododendrons of English gardens have nearly all sprung, from seed collected by the late Sir Dr. J. H. Hooker in the Sikkim Himalayas (1847--51). But others have since been collected, and a whole group of very beautiful epiphytic species occur in the forests of north-west Burma.

Rhododendron nilagiricum *Zenk.* formerly R. arboreum *Sm. ; F.B.I.* iii 465, VIII 10. A small tree with very rough bark stiff elliptical white-backed leaves, erect in bud, and masses of blood-red or crimson flowers, very conspicuous in January.

Height 15 to 20 feet ; bark very thick. Leaves elliptic or lanceolate, acute at both ends, rusty or silvery-white underneath, dark green above, very coriaceous and stiff, with strongly recurved margins ; in bud erect and showing their silvery backs, later spreading or drooping but stiffly ; about two and a half times as long as broad, 3 to 6 inches long, with stalk of $\frac{1}{2}$ to $\frac{3}{4}$ inch. Flowers subsessile, in dense terminal bunches 4 to 8 inches across. Bud of the whole inflorescence, large egg-shaped. Corolla $1\frac{1}{4}$ inches long and wide, red. Capsule oblong, $\frac{3}{4}$ by $\frac{3}{8}$ inch, woody. **t. 312.** Wight Sp. Nilg. t. 131.

Very common on both plateaus. Nilgiris : everywhere, quite common in and near Ootacamund. Pulneys : conspicuous on exposed hill-tops, its thick bark enabling it to stand the yearly grass fires.

Gen. Dist. Mountains of South India, Himalayas, Burma.

PRIMULACEÆ.

Perennial herbs with alternate or opposite, often radical, leaves ; and perfectly regular flowers with five-lobed calyx, five-lobed monopetalous corolla, five stamens attached to the corolla tube *opposite* its lobes,

superior ovary of one cell with free central placenta covered with kidney-shaped ovules, and capsular fruit opening by a transverse slit or in valves.

Species 100, chiefly in temperate and Alpine regions.

In Europe are Primula (Primrose, Cowslip, *Fr.* Primevere, *Ger.* Schlusseldume); Hottonia (Water-violet); Cyclamen; Centunculus; Glaux; Samolus (Brookweed); Lysimachia; Anagallis.

Capsule opening by valves . . . . LYSIMACHIA.
Capsule opening by transverse slit . . . . . . ANAGALLIS.

LYSIMACHIA. F.B.I. 87 V.

Stem herbaceous, erect or creeping. Leaves alternate or opposite, simple. Flowers in racemes, or solitary at the leaf-axils. Corolla *twisted* in bud (distinction from Primula, etc.). Stamens attached to the base of the corolla and opposite its lobes. Ovary globose: style slender, persistent on the capsule which opens *by valves*. Seeds many with thick tight seed-coat.

Species about 60, mostly in the sub-tropical and temperate climates of the northern hemisphere but a few also in tropical and southern Africa, Australia and South America.

In Britain 4 species—Loosestrife, Yellow Pimpernel, etc.

Lysimachia Leschenaultii *Duby ; F.B.I.* iii 501, V 1.

* (*Ordinary form*). A small herb perennial by a knotted rootstock. Stem round, pubescent, reddish, clothed to the base by the green or withered leaves. Leaves opposite or nearly so, often tufted beacuse of axillary buds, oblanceolate or narrow oblong, entire, finely white-dotted below, glabrous above and mottled with brown internal glands, herbaceous, erect: veins green, scarcely visible. Flowers in a close terminal handsome raceme 2 to 4 inches long, pink. Bracts linear, $\frac{1}{4}$ inch: pedicel $\frac{1}{2}$ to 1 inch, slender. Sepals $\frac{1}{6}$ inch, lanceolate, acuminate, with thin margins. Corolla tube short; lobes

(petals) obovate, $\frac{1}{3}$ inch, spreading. Stamens slightly longer, spreading and well exserted. Fruit a perfectly round capsule, $\frac{1}{8}$ to $\frac{1}{6}$ inch, sitting inside the now recurved sepals, and surmounted by the filiform $\frac{1}{4}$ inch style; at length opening in five or six oblong valves which spread out flat. Seeds about eleven, black, with rounded outer (dorsal) side and ridged inner, and covered all over with a fine raised network. **t. 313.** Wight Ic. t. 1204; Sp. Nilg. t. 132.

In wet places, very common on the Pulneys, on the open downs and round the shores of the lake at Kodaikanal. Nilgiris: near Ootacamund but not common; on the downs to Pykara and Kotagiri.

Gen. Dist. These mountain tops only.

** (*Large form*). Grows to 4 feet. Leaves 2 by $\frac{3}{4}$ inch, elliptic. Spike short corymbose. Corolla funnel-shaped. Stamens not exserted.

Pulneys: on the margins of Sholas above 7,000 feet.

Lysimachia deltoides *Wight, Cat.* 109*!; F.B.I.* iii 505, V 14; Creeping Jenny. A trailing herb with, mostly opposite, ovate leaves and flat yellow flowers.

Stem slender, round, pubescent, purple or brownish, prostrate; all except the corolla hairy or pubescent. Lower leaves opposite, upper alternate, their stalks $\frac{1}{8}$ to $\frac{1}{4}$ inch, brownish purple like the stem; blades broadly ovate, of the lowest leaves as little as $\frac{1}{8}$ inch long, of the middle ones $\frac{3}{4}$ by $\frac{1}{2}$ inch larger or smaller, usually more or less erect. Pedicels solitary in the leaf-axils, slender, $\frac{3}{4}$ to 2 inches. Sepals $\frac{1}{4}$ inch, lanceolate, acute, covered outside and in with small red glands. Petals $\frac{1}{4}$ by $\frac{1}{5}$ inch, ovate, obtuse, with a few red glands, and connected only at the base into a tube of $\frac{1}{20}$ inch. Stamens five:

filaments connate at the base into a tube $\frac{1}{20}$ inch, seated on the corolla tube and bent abruptly inwards above: anthers $\frac{1}{16}$ inch opening inwards. Fruit a capsule. **t. 314.** Wight Ill. t. 144.

On cool shady banks and on the open damp hill-side. Pulney downs: in and near Kodaikanal: flower May. Nilgiris: Ootacamund, Pykara and Coonoor.

Gen. Dist. Ceylon, Nilgiris and Pulney mountains only.

All the sheets from both the Nilgiri and Pulney mountains at Kew (August 1914) are named in Sir J. D. Hooker's writing "*var* cordifolia." Wight's Herb. Prop. No. 109, named by him "L. deltoides *R.W.*" and presumably therefore the type plant, is a Ceylon specimen. I am unable to distinguish it from ours.

Closely allied to the European L. nummularia *L.*, *Eng.* Creeping Jenny or Money-wort, *Fr.* Chasseborse, *Ger.* Egelkraut and similar to it; and also to L. nemorum *L.*, *Eng.* Yellow Pimpernel, *Fr.* Corneille de bois.

Lysimachia obovata *Buch Ham.*; *F.B.I.* iii 502, V 4. A slender herb. Leaves oblanceolate or spathulate acute, glabrous, gland-dotted. Flowers white in slender terminal racemes. Filaments of stamens slender not exserted.

Nilgiris: at 7,000 feet on the downs [*G.F.M.P.*].

F.B.I. gives this species as in Manipur, Burma and Java. I have not seen it.

ANAGALLIS. F.B.I. 87 VII.

Slender herbs with opposite entire leaves and solitary blue or red flowers, stalked without bracteoles in the leaf-axils; and characterized by the flat corolla of five lobes twisted in bud, the filaments of the stamens hairy, and the globose, capsule opening by a transverse slit. Seeds numerous plano-convex, attached by the middle.

Species in north temperate regions and temperate South America.

Anagallis arvensis *Linn.; F.B.I.* iii 506, VII 1; common Pimpernel. Stem weak, four-angled. Leaves opposite, subsessile, ovate, glabrous, gland-dotted, entire. Flowers on long slender pedicels in the leaf-axils. Sepals five, linear, $\frac{1}{4}$ inch. Corolla $\frac{1}{2}$ inch, pink or less often blue. Capsule globose. Seeds many. Wight Sp. Nilg. t. 133 (A. latifolia).

Nilgiris: Lovedale and Ootacamund. Pulneys: Shembaganur. Shevaroys: abundant above marsh on Green Hills.

A common weed of cultivation in the cooler temperate regions.

Known also in England as Poorman's Weatherglass, *Fr.* Menronne des champs, *Ger.* Roter Gauchheil.

MYRSINACEÆ.

Shrubs and small trees with alternate simple gland-dotted leaves, and regular flowers: a monopetalous corolla with short teeth and usually five lobes: stamens as many opposite the lobes; anthers opening by slits (not terminal pores): ovary one-celled with free central placenta: fruit small, sub-baccate: and seed one or more, globose, with transverse embryo, and endosperm pitted or indented by the folding of the inner seed coat.

Species 500, all tropical or sub-tropical.

Leaves toothed: flowers in racemes . . . . . MÆSA.
Ls. entire with brown glands: petals imbricate . MYRSINE.
Leaves entire: petals twisted, pink . . . . . . ARDISIA.
Climber: flrs. small, white, in spikes . . . . . EMBELIA.

MÆSA. F.B.I. 88 I.

Shrubs and small trees with alternate, entire or toothed, leaves and small flowers in terminal or axillary simple or branched racemes, with a small bract subtending the pedicel, and two bracteoles at the base of the

calyx. Sepals, corolla lobes, and stamens five. Fruit enclosed, not quite to the top, in the calyx tube.

Species 35; or according to some authors, by splitting of species, over 100.

Mæsa Perrottetiana *DC.; F.B.I. under* M. indica *Wall.*, iii 509, I 5.* Shrub, with much-lenticelled twiggy branches. Leaf-stalks $\frac{3}{4}$ inch: blades variable, usually broadly ovate, narrowed at the base, acute or shortly acuminate with sharp triangular serrations, glabrous: nerves about eight to ten on each side nearly straight. Racemes slender, 2 to 4 inches, sometimes branched: pedicels $\frac{1}{2}$ inch. Sepals not ciliate. Corolla when open $\frac{1}{8}$ inch. Fruit a small green berry $\frac{1}{8}$ inch globose, with calyx-teeth showing near the top, and surmounted by the small style. Seeds many on a round placenta which projects into the hollow of the fruit from one side. Often in place of the normal fruit there is an inflated hollow ovary enclosed in a white fleshy calyx with aborted seeds giving the appearance of a white berry. **t. 315.** Wight Ic. t. 1206; Sp. Nilg. t. 134.

Nilgiris: very common in the shola at Kotagiri. Coonoor: not at higher levels. Also Shevaroys at Yercaud. *Fyson* 1726, 41. *Bourne* Coonoor, etc.

This was included by C. B. Clarke in F.B.I. under M. indica *Wall.* as a variety. I have not seen Roxburgh's plant (Wallich's type) but it was a native of Chittagong (Roxb. Fl. Ind. Ed. Carey and Wallich ii 230) and examples from the same district have sinuate almost entire, not sharply serrate leaves, much shorter and more divided axillary panicles of flowers and ciliate sepals.

RAPANEA.

Shrubs and trees with rather thick branchlets on which the flowers are closely set in small fascicles, and small one-seeded fruits, with the endosperm more or less indented by the seed-coat.

Species about 140, natives mostly of the tropics of Asia, Africa and America, a few in extra-tropical Africa, the Atlantic islands and New Zealand.

Formerly included in the genus MYRSINE but separated by C. Mez in a monograph of the family (*Das Pflazenreich* iv 236) because of the absence of any style between the ovary and the large stigma, and the much less ruminate endosperm.

Rapanea Wightiana *Wall., Cat.* 2300 ; *F.B.I. as* M. capitellata *var* lanceolata, iii 512 ; II 3.* A tree with erect gland-streaked leaves, mostly at the ends of the branchlets, and small flowers thickly set lower down on them.

Tree with ascending branches, occasionally very large ; when small pyramidal or sharply pointed in outline. Leaves close-set, erect, 1½ to 3 inches by ¾ to 1¼ inches, oblanceolate-obtuse, narrowed to the short stalk ; upper side dark dull green, underside with translucent dots or narrow streaks (oil cavities). Flowers brown fascicled in the axils of the fallen leaves on pedicels of $\frac{1}{6}$ to ¼ inch. Petals $\frac{1}{12}$ inch. Anthers nearly as long. Ovary $\frac{1}{16}$ inch, with a thick stigma, equally long, jointed to it. Fruit ⅛ inch globose, occasionally fleshy on the outside and then ¼ inch : stigma long persistent but at length falling. **t. 316.** Wight Sp. Nilg. t. 137 ; Ic. t. 1211.

Nilgiris : very common all over the downs, of both sides of the plateau. Pulneys : in some of the sholas on the downs above Kodaikanal as very large trees, pedicels of flowers longer. Shevaroys.

Gen. Dist. These hills, Western Ghauts, Bababoodons.

Myrsine capitellata *Wall. Cat.* 2296 ! with which this is united in F.B.I. as a variety, is a Nepal plant with much larger leaves and nearly sessile flowers.

The ascending branches and erect leaves, of our plant, are very characteristic, as also are the flowers and small fruits thickly set on the branchlets just below their leafy tips, much

as in Eurya japonica (p. 53), from which species however, even in fruit, the toothless leaves, their oil-glands, and the single seed, at once distinguish our plant.

The fleshy covering to the fruit I have found very perfect on the Ootacamund downs in May. Possibly, as suggested by Wallich this is in the nature of a gall. A similar growth of M. africana L. It sometimes becomes scaly. Appears (as seen by me on a South African specimen) very similar. The "scales" of Clarke's *var* lepidocarpon (F.B.I. *l.c.*) and the "emergences" of Mez. (*l.c.* s. 10) appear to be the dried and decaying remains of this.

Rapanea Thwaitesii *Mez ; G.F.M.P.* IV 751. A small tree. Leaves oblanceolate, covered on the underside with dots black when dried—not streaks. Flowers and fruits with $\frac{1}{8}$ to $\frac{1}{4}$ inch, pedicel.

Shevaroys : Green Hill fruiting June. Pulneys at 6,500 feet (height).

EMBELIA. F.B.I. 88 III.

Usually climbing shrubs with entire leaves. Flowers in axillary or terminal racemes, small, white or greenish, mostly unisexual and diœcious. Petals nearly free, imbricate. Fruit a small one-seeded berry. Embryo curved.

Species about 100 in the tropics.

Embelia ribes *Burm ; F.B.I.* iii 513, III I. A thin stemmed climbing shrub, with drooping branches bearing glossy leaves all facing upwards. Leaves elliptic-oblong or obovate with blunt cuspidate apex, quite entire usually perforated on the underside near the midrib. Panicles terminal and axillary pubescent with grey hairs. Flowers $\frac{1}{12}$ inch, white ; pedicels as long or longer. Petals imbricate. Fruit globose, $\frac{1}{6}$ inch. **t. 317.** Wight Ic. t. 1207.

Nilgiris : Coonoor, Wellington, etc., common in Sholas, Pulneys : Shembaganur, etc.

Embelia Basaal *A.DC.* formerly E. Viridiflora *Schff.* ; *F.B.I.* iii 516, III 10 ; Altogether a more robust plant than the last. Flower bearing branches not drooping. Leaves 3 by 2 inches elliptic. Berries green, orange or red, $\frac{1}{3}$ inch. **t. 318.**

Nilgiris : Coonoor, Wellington, Kotagiri. Shevaroys.

ARDISIA. F.B.I. 88 V.

Trees or shrubs. Petals twisted to the right in bud, red or white. Anthers sagittate on very short stalks. Fruit globose with one seed. Albumen ruminate.

A tropical family of about 200 species.

Ardisia humilis *Vahl ; F.B.I.* iii 529, V 45 ; A tree. Leaves to 6 by 3 inches, entire. Flowers in umbel-like panicles on peduncles of about 2 inches, pink, with thick waxy petals. Fruit globose, one-seeded.

Pulneys : possibly at Kodaikanal. Shevaroys : near 'Lady's seat.' Common at low levels throughout India.

Ardisia rhomboidea *Wt. ; F.B.I.* iii 529, V 44. Leaves rhomboid, elliptic or obovate, wedge-shaped at base with or without a short acumen. Flowers pinkish-white, in small umbels of 3 to 5 ; peduncle $\frac{1}{2}$ to 1 inch ; pedicels $\frac{1}{4}$ inch.

Nilgiris : Coonoor (Mayuranathan).

Gen. Dist. Travancore and Tinnevelly mountains.

SAPOTACEÆ.

Trees and shrubs with rust-coloured tomentum on the younger parts ; alternate, leathery, entire, leaves ; and axillary clusters of perfectly regular monopetalous flowers, with four to eight sepals in one or two whorls, a four or five-lobed corolla and a superior ovary of as many

one-seeded cells : characterized by the seed having a very hard shiny coat and long hilum-scar, and in many, but not all cases, by there being developed on the backs of the corolla-segments other lobes, so that there appear to be several concentric circles of petals, and by the presence often of two or three circles of stamens and an inner circle of staminodes.

Species 350 in the tropics of the whole world. On the plains *Bassaia*, *Mimusops*, and *Achras sapota* the Sapodilla (cultivated).

KEY TO THE GENERA.

Sepals and petals 5. Sts. 5. Staminodes 5. . SIDER OXYLON.
Sepals and petals 4. Stamens 8, all perfect . ISONANDRA.

SIDEROXYLON. F.B.I. 89 III.

Trees with alternate entire leathery leaves, rusty-tomentose on the young parts and flower-stalks. Flowers clustered at the leaf-axils, subsessile or shortly pedicelled. Sepals five, imbricate. Corolla tube campanulate ; lobes five. Stamens five attached to the base of the corolla ; staminodes five lanceolate. Ovary villous, five-celled. Berry egg-shaped, with five or four seeds.

Species 60, mostly in the tropics.

Sideroxylon tomentosum *Roxb. ; F.B.I.* iii 538, III 7, var elengoides *Gamble.* Easily recognized when in flower by the downward pointing closed flowers, like sharp cones with protruding curved style.

A small tree often with long axillary spines : young shoots, sepals, and veins, and upper side of petioles, rusty tomentose. Twigs lenticelled. Leaves alternate. Petiole $\frac{1}{4}$ inch : blade $1\frac{1}{2}$ to $4\frac{1}{2}$ inches by $\frac{3}{4}$ to 2 inches, elliptic or obovate, entire, glabrous except for a little tomentum

on the impressed veins shiny, hard: veins about eight to ten pairs straight with fine reticulation between. Flowers two or three together in the upper axils, facing downwards. Pedicel $\frac{1}{4}$ inch, Sepals four to five, triangular acute, $\frac{1}{5}$ inch. Corolla tube $\frac{1}{8}$ inch: lobes acute slightly longer than the sepals, with the edges curved inwards as they fade. Staminodes five, alternate with the petals, and close against the ovary, acuminate, and fimbriate, densely hairy on the inside. Stamens between and inside the staminodes: anthers acute Ovary very hairy; style slender, long exserted. Fruit sitting on the dried calyx, the size of a small Indian hen's egg, one to five-celled, with milky flesh. Seeds one in each cell, with very hard, brown shiny coat except for a long hilum; endosperm white, oily, embryo straight cotyledons thin. **t. 319.** Wight Sp. Nilg. t. 141.

In sholas on the Nilgiri and Pulney plateaux, common, flushing a blaze of scarlet with young leaves in December. Flower and fruit before the rains. Especially common between Ootacamund and Pykara. Biccapatti.

Gen. Dist. Western Ghauts; Pegu and Martaban (F.B.I. fide Kurz.). Ceylon.

I have found, on an occasional flower, tiny scales on the outside of the petals, near the tip.

The mechanism of pollination appears to be as follows: The buds point downwards at about half a right angle, with the style protruding and always curled upwards. The stigma appears to be receptive at an early stage, though more so later on. When the flower opens the petals spread widely, with the anthers which have already dehisced, pressed up against them by their stiff filaments. The staminodes are curled inwards with rounded backs and tips curled up against the style, so covering the nectariferous disc. This latter is usually dry, but if stimulated by the contact of a bristle becomes wet with a copious exudation of honey. An insect visiting the flower for honey would have to hang on the flower and in probing for the

narrow slits between the staminodes, by which alone access to the honey is possible, would shake the corolla and be dusted with pollen : the style being curled upwards out of the way would not receive this pollen. The flower closes again before dropping off, and autogamy would occur as the corolla and stamens fell off past the style.

ISONANDRA. F.B.I. 89 IV.

Trees with alternate, coriaceous glabrous leaves. Flowers small, inaxillary clusters. Sepals and petals 4. Stamens 8 ; no staminodes. Ovary four-celled. Fruit a one-seeded ellipsoid berry.

Species few, in South India and Ceylon.

Isonandra Candolleana *Wt. ; F.B.I.* iii 539, IV 2 ; Leaves obovate oblong, tapering at the base ; quite glabrous ; main veins eight to ten pairs raised on underside and very distinct, connecting veinlets also raised nearly straight and parallel. Flowers $\frac{1}{6}$ inch, anther tips hairy. Berry $\frac{3}{4}$ by $\frac{1}{4}$ inch. **t. 320.**

Nilgiris and Pulney hills, on the plateau. Bangitappal, flower May.

Honandra Perottetiana *Wt. ; F.B.I.* iii 539, IV 3 ; Similar to the last species, but anther tips not hairy, veinlets less distinct.

Nilgiris : above 4,000 feet. Wight [*G.F.M.P.*].

EBENACEÆ.

A family of tropical trees.

DIOSPYROS. F.B.I. 90 II.

Trees with alternate leaves and flowers male or female on different trees, in nearly sessile cymes or bunches along the branches. Corolla lobes twisted to the right in bud :

male flowers with four to many stamens, with thin anthers and a rudimentary ovary: female with many barren stamens and a four to five-celled superior ovary. Fruit a berry, under which the calyx lobes are often enlarged, containing many rather flat seeds. Seeds in some with ruminate endosperm.

A large genus, in the tropics of the whole world.

Diospyros montana *Roxb; F.B.I.* iii 555, II 6; Leaves ovate or oblong, 2 to 3 inches, acute or cordate at the base, glabrous. Veins and veinlets not raised, but distinct. Stamens 16, glabrous. Female flowers solitary: fruit about 1 inch, lobes of calyx below it $\frac{1}{4}$ to $\frac{1}{3}$ inch, endosperm of seeds not ruminate.

Shevaroys: on the lower plateau.

G.F.M.P. gives this species as on the Eastern Ghauts only.

SYMPLOCACEÆ.

Included in F.B.I. in STYRACEÆ, only genus.

SYMPLOCOS.

Trees or shrubs. Leaves alternate, simple, stalked, glossy. Flowers in the leaf-axils, solitary or in fascicles or short spikes or racemees, quite regular. Sepals five. Corolla of three to eleven petals, more or less united at the base. Stamens attached to the corolla, four to many, in one or more series. Ovary inferior or semi-inferior, of two to five cells, each with two to four ovules. Style slender: stigma capitate. Fruit a berry, but usually with only one seed. Seed-coat thin: endosperm thick: embryo straight or curved, with large radicle and very short cotyledons.

Species 280 (Brand in *Das Pflanzenreich* IV 242). Natives of the tropics of America and Australia.

The white flowers are at first sight very like those of the Black-thorn, and smelling much the same, might easily be mistaken by any one acquainted with the English flora for one of the family ROSACEÆ, especially as the tubular part of the corolla is excessively short, and being covered by the stamens does not appear till the corolla is removed.

Leaves more or less serrate . . . . *c*

b { Flowers pink, $\frac{1}{2}$ long, pendant . . . . S. pendula.
Flowers white $\frac{1}{2}$ to $\frac{3}{4}$ inch diameter flat . . S. obtosa.

c { Spikes 2 to 4 inches ; many flowered . . . . *d*
Spikes $\frac{1}{2}$ or more, flowers 2 to 4 only . . . .

d { Leaves thick, serrate to $\frac{3}{4}$ of margin, drying golden. Fruit $\frac{1}{4}$ inch, conical . . . . S. spicata.
Leaves thin, serrate to base, fruit oblong, $\frac{1}{2}$ inch . . . S. foliosa.

e { Leaves 1 to 2 inches, glabrous, flowers $\frac{1}{2}$ inch . . . . S. microphylla.
Leaves 4 to 6 inches, with cottony hairs, flower 1 inch. . S. pulchra.

Symplocos spicata *Roxb.*, *Wall.*, *Cat.* 4416 *! ; F.B.I.* iii 573, I 2. Leaf-stalks stout, $\frac{3}{4}$ by $\frac{1}{8}$ inch, the older often scarred below, obscurely channelled above. Leaves very thick, glossy like the common Laurel of English gardens, ovate-elliptic, serrate, the teeth extending from the apex where they are $\frac{1}{16}$ inch apart, to about two-thirds of the way down, and there $\frac{1}{6}$ inch apart but barely visible : after falling time a golden or brass colour. Spikes of flowers axillary and often branched. Flowers sessile, with a small bract and two equally small bracteoles, flat, white. Petals $\frac{1}{6}$ inch, white, later tinged with yellow, rounded in. Filaments straight, $\frac{1}{8}$ to $\frac{1}{4}$ inch, white : anthers minute. Style as long, widening at the tip to the small yellow stigma. Fruit $\frac{1}{5}$ inch, nearly globose or conical, ribbed or smooth crowned by the minute calyx. **t. 321.** Wight Ill. t. 150.

Because it has shorter spikes and larger flowers than the type and often smaller leaves our plant was formerly considered a variety (*laurina*).

Pulneys: on the downs above Kodaikanal, by streams. Nilgiris: abundant on eastern plateau. Kotagiri, Coonoor, Kodanad and lower levels down to 3,000 feet on the Mysore plateau. Shevaroys.

The carpet of yellow fallen leaves is so characteristic, it betrays the tree when perhaps otherwise hidden.

Gen. Dist. (of the species) from Sikkim through Khasia and Assam to Burma and Malacca, China, Japan, Australia and Polynesia (a variety or possibly another species.)

Symplocos foliosa *Wight ; F.B.I.* iii 582, I 39. A tree with smooth grey bark, lumpy foliage, large silky leaf-buds, flowers $\frac{1}{3}$ or $\frac{1}{2}$ inch, in short axillary spikes ; and peculiar in the toothing of the leaves which extends from the apex almost to the stalk.

Young parts and leaf-stalks hairy, older branchlets glabrous with but few lenticels. Leaf-stalks $\frac{1}{4}$ to $\frac{1}{2}$ inch : blades elliptic, 2 to 6 by $\frac{3}{4}$ to 2 inches, acute or acuminate, serrate almost to the base ; veins about ten pairs rather straight leaf-buds $\frac{1}{2}$ inch, globular, silky. Spikes erect, strongly pubescent : flowers subsessile. Calyx-tube $\frac{1}{8}$ inch, pubescent. Corolla $\frac{1}{2}$ inch flat, white. Fruit erect, yellowish green, $\frac{5}{8}$ by $\frac{1}{4}$ inch, oblong, rounded at both ends, with a small calyx-scar at the top. **t. 322.** Wight Ic. 1234 and 1235.

In sholas where it may be recognized by its lumpy foliage on both plateaus ; flowering winter and spring, fruiting early summer.

In its smooth bark and silky young leaves it reminds one of the English Beech.

Symplocos microphylla *Wt. ; F.B.I.* iii 581, I 34. A shrub of about 6 feet. Leaves elliptic ovate or obovate, 2 to 3 by 1 to 2 inches closely serrate, from base to apex,

coriaceous, veins 5 to 6 pairs ; margin recurved, yellow when dry. Spikes short of 3 or 4 flowers only. Fruit obovoid oblong with prominent calyx above. Wt. Ic. t. 1232.

Nilgiris : on south-west downs beyond Avalanche [*G.F.M.P.*].

Distinguished from S. foliosa by being a shrub and by its shorter broader leaves with fewer veins, and shorter spikes : but I have specimens collected near Ootacamund which appear to be intermediate in these respects.

Symplocos pulchra. *Wt.* ; Sp. Neilg. **t.** 143. A diffuse shrub, branches and leaves covered with long brown hairs. Leaves oblong-acuminate, 4 to 5 by 1½ inches base rounded : finely toothed ; veins 7 pairs : spikes about 2 inches with 1 or 2 large flowers. (1 inch or more diameter only.)

Nilgiris : Sispara, 4,000 to 5,000 feet by streams.

Symplocos obtusa *Wall.* ; *F.B.I.* iii 583, I 43. All parts glabrous. Branches sub-umbelled, usually four at a forking ; youngest tinged with purple ; the previous year's with thin almost black bark, marked with a few longitudinal lenticels ; older with grey bark. Leaf-stalks $\frac{1}{2}$ inch, purple : blades erect, 2 to 3½ by 1 to 1¼ inches, elliptic or obovate-elliptic, emarginate or obtuse, shallowly crenate except near the acute base, thickly coriaceous ; margins reflexed. Spikes 1 to 2 inches. Flowers five to eight, white, $\frac{1}{2}$ to $\frac{3}{4}$ inch across, quite glabrous : bracts $\frac{1}{2}$ inch soon falling. Calyx-tube sessile, $\frac{1}{8}$ inch : lobes rounded, minute. Petals concave tinged on the outside, like the calyx lobes, with pink : tube $\frac{1}{50}$ inch. Stigma three-lobed, velvety, dark brown. Scent very slight. **t. 323.** Wight Sp. Nilg. t. 146 ; Ic. t. 1233.

Pulneys : in sholas above Kodaikanal. Nilgiris : about Ootacamund flowering spring months.

Gen. Dist. South Indian mountain tops only. Examples from Ceylon though nearly allied appear to be different.

Symplocos pendula *Wight ; F.B.I.* iii 587, I 60. A tree with erect entire smooth leaves and small pinkish pendant flowers and narrow oblong fruits, hanging at the leaf-axils.

Tree up to 20 feet : bark rough. Leaves smooth and glossy, quite entire, obovate or elliptic, acute at both ends or bluntly acuminate 2 to 3½ by 1 to 2 inches, erect on the short pink stalk : midrib strongly impressed on the upper side. Flowers two or three together at the leaf-axils : pedicels $\frac{1}{6}$ inch, with a small bract at the base, and broadening above into the $\frac{1}{8}$-inch calyx-tube. Corolla ½ inch, pink. Style longer, with capitate stigma. Fruit oblong, rounded at each end, hanging, with the dried calyx lobes at the base quite small and contracted and enclosing one stone. **t. 324.** Wight Ic. t. 1237.

Pulneys : in sholas on the downs 7,000 feet and above. Not on the Nilgiris.

Gen. Dist. Also Ceylon.

OLEACEÆ.

Privet and Jasmine.

Shrubs, sometimes climbing, and trees, with opposite leaves. Regular flowers with small calyx, a monopetalous corolla of five or more lobes, but only two stamens, and a superior ovary of two cells each with one seed. Fruit a capsule drupe or berry.

Species 300 in tropical and temperate regions.

The family is divided into four tribes represented by (i) Jasmine, (ii) Lilac, (iii) Ash and (iv) Olive and Privet. The first and last only of these are represented here.

KEY TO THE GENERA.

a { Flowers $\frac{1}{2}$ in. or more : few, at the leaf axils. . JASMINUM.
Flowers $\frac{1}{4}$ in. or less many, in terminal panicles . . *b*.

b { Endocarp of fruit bony : petals 4 . . . . OLEA.
Endocarp of fruit thin and papery : petals 5 or 6 . . . . LIGUSTRUM.

JASMINUM. F.B.I. 92 I.

Shrubs or woody climbers with opposite, simple or pinnate leaves. Flowers nearly always white with narrow corolla tube and spreading lobes, imbricate in bud : the calyx with linear or triangular lobes (sepals). Fruit a two-lobed berry (unless one carpel fails to develop), each lobe with one seed in which the radicle points downwards.

Species 140 to 160 nearly all in the tropics of Asia and Africa ; and of these over 50 in India.

Many have particularly fragrant flowers and are common as cultivated plants, e.g., J. sambac *Ait.*, on the plains and all over the tropics of both hemispheres ; and J. officinale *L.*, the common white-flowered climber of English and our hill gardens, but a native of Kashmir and Persia.

a { Leaves pinnate, flowers yellow bell-shaped shrub . . . 6. J. bignoniaceum.
Leaves simple or with 2 basal leaflets, flowers white . . *b*

b { Low rigid shrub, quite glabrous . . . 4. J. rigidum.
Climbing or weak-stemmed plants . . . . *c*.

c { Sepals linear $\frac{1}{8}$ to $\frac{1}{2}$ inch, leaves never compound . . . *d*.
Sepals triangular $\frac{1}{8}$ inch, leaves hairy . . . . . 5. J. brevilobum.

d { Sepals and leaves very hairy . . . 2. J. pubescens.
Sepals and leaves glabrous or nearly so . . . . . . *e*.

e { Leaves acute at base broadly elliptic . 1. J. sambac var.
Leaves cordate at base, lanceolate-acute . . . . . 3. J. cordifolium.

1. **Jasminum sambac** *Ait ; F.B.I.* iii 591, I 1, may perhaps be found cultivated. It differs from j. cordifolium in its scented flowers, pubescent or nearly glabrous sepals and leaves acute at the base.

Widely distributed in India.

Var. **heyneana** *C. B. Clarke* I 1. Scandent with thin flexible stem. Leaves simple, ovate with rounded or cuneate base, acute or obtuse, nearly glabrous, ½ to 1½ inches. Cymes three-flowered. Calyx teeth $\frac{1}{16}$ to ⅛ inch. Corolla tube ½ inch.

Pulneys : near Kodaikanal in Bearshola.

Clarke in F.B.I. suggests that this is a cultivated variety.

2. **Jasminum pubescens** *Willd. ; F.B.I.* iii 592 I 3. A climbing shrub, very hairy all over. Sepals linear ⅓ inch, hairy. Corolla tube 1 inch, lobes oblong acute. Wt. Ic. tt. 702 and 1248.

Nilgiris : Lovedale (Coll. Mayuranathan) perhaps cultivated.

Gen. Dist. Western Ghauts to 5,000 feet.

3. **Jasminum cordifolium** *Wall. ; F.B.I.* iii 596 I 15. Characterized by rather large glabrous leaves and scentless flowers. Leaves up to 6 inches long, tapering gradually from the wide, slightly cordate base to a long-drawn point ; quite glabrous : lateral veins few, but prominent near the base. Cymes on short axillary branches, with one or two linear bracts. Sepals linear, ½ inch, glabrous ; corolla tube 1 inch or more, lobes ½ inch oblong or obovate, suddenly acute : scentless. Capsule ellipsoid, black. **t. 325.** On small trees, at the margins of sholas, etc.

Nilgiris : Eastern plateau. Biccapatti, Kodanad. Coonoor.

Gen. Dist. Western Ghauts. Tinnevelly.

4. **Jasminum rigidum** *Zenker ; F.B.I.* iii 598, 125. A dense shrub with often rather small ovate or elliptic ovate shining leaves. Sepals linear, $\frac{1}{3}$ inch, glabrous. Corolla tube 1 to $1\frac{1}{4}$ inches, longer than the rather broad lobes very fragrant. On rocky hill sides as dense bushes.

Nilgiris: Coonoor at 6,000 feet. Kotagiri, Kodanad, Biccapatti, Shevaroys : Honey Rock.

Gen. Dist. Deccan and Carnatic, plains and hills.

Very similar to Carissa paucenervia which grows in like situations, but without thorns or milky juice and flowers larger (p. 392).

5. **Jasminum brevilobum** *DC. ; F.B.I.* iii 600, I 33. A shrub with weak scandent softly hairy branches, shortly stalked ovate leaves and terminal bunches of white flowers. Stems spirally twisted probably of several strands, like a thick rope up to 1 foot diameter.

Branches terete pubescent. Leaf-stalks $\frac{1}{4}$ inch : variable in size on the same branch, up to blade $1\frac{1}{4}$ by 1 inch, ovate with very rounded or subcordate base and small mucro, entire ; pubescent on the underside like the stalk, less so or nearly glabrous on the upper ; sometimes with, but often without, a pair of small lobes or leaflet . Flowers in terminal capitate cymes very fragrant. Sepals triangular, hairy corolla tube 1 to $1\frac{1}{2}$ inches, lobes $\frac{1}{3}$ to $\frac{5}{8}$ inch, ovate Carpels in fruit black, $\frac{1}{3}$ inch. **t. 326**.

In thickets and on the outskirts of sholas, common on both plateaus. Nilgiris : everywhere about Ootacamund, flowering after the monsoon rains, and down at least to Kotagiri, Coonoor and Naduvattam. Pulneys : not on the highest levels but near Kodaikanal and Poombari, flowering June.

Gen. Dist. Western Ghauts above 3,000 feet.

6. **Jasminum bignoniaceum** *Wall. ex DC. ; F.B.I.* included in Jasminum humile *Linn.*, iii 602 ; I 40. *

An erect shrub with numerous green, very angular branches. Leaves alternate, 1 to 3 inches, pinnate with about seven leaflets : main stalk grooved above, green : leaflets $\frac{1}{2}$ by $\frac{1}{4}$ inch, elliptic-acute at both ends, or diamond-shaped, dull green on both sides. Flowers solitary or in dense cymes at the ends of the twigs, full yellow : pedicel $\frac{1}{3}$ inch, pubescent, expanded below the calyx. Calyx $\frac{1}{12}$ inch ; teeth, triangular, very small glabrous. Corolla-tube $\frac{1}{2}$ to $\frac{5}{8}$ inch, $\frac{1}{16}$ inch wide at the base and $\frac{1}{6}$ inch just below the spreading $\frac{1}{4}$ inch limb of five triangular lobes. Anthers $\frac{1}{8}$ inch, sessile near the top of the tube, opening inwards. Style bent, appressed to one side of the corolla tube at the base ; stigma large, exserted above the corolla. Fruit of two globose berries, $\frac{1}{4}$ to $\frac{1}{3}$ inch each. Wight Sp. Nilg. 151. t. 327.

Nilgiris : near sholas, all over the downs flowering April. Pulneys : Glen Falls near Kodaikanal, etc., apparently nowhere else.

The style is too long for the bud and is bent up inside it. When the flower opens the style straightens and carries the apparently ripe stigma outside and well above the anthers. The stigma is large and could hardly fail to be touched by an insect visiting the flower.

For a note on J. humile *L.*, the species with which this was united in the F.B.I. see the Fl.N. & P. Ht. I, p. 277.

OLEA. F.B.I. 92 VIII.

Olive.

Shrubs and trees with opposite leaves and terminal or axillary panicles of small flowers with four small calyx points, four corolla lobes folded inwards not twisted in bud, two stamens, an ovary of two cells each with two pendulous ovules, and fruit an ellipsoid or nearly globular

drupe resting in the cup-shaped enlarged top of stalk, with one seed only enclosed by a hard bony endocarp (distinction from LIGUSTRUM).

Species about 35, from the north temperate zone southwards to South Africa and New Zealand.

Name from ELAIA *the Greek for the Olive.*

Corolla deeply lobed : leaves glandular at the nerve axils . . O. glandulifera.

Corolla campanulate, lobes short : leaves drying reddish brown . . . . O. polygama.

Olea glandulifera *Wall ; F.B.I.* iii 612, VIII 2. In Fl.N. & P. Ht. as O. Bournei. A tree, standing sometimes higher than the rest of the shola, occasionally in the open. Branches grey, much lenticelled ; the smaller twigs very regularly opposite and decussate, slightly or much swollen at the nodes. Leaves spreading or laxly drooping : stalk $\frac{3}{4}$ to 1 inch, slender, appressed, against the stem, puberous : blade lax, broadly ovate or elliptic-acuminate, narrowed at the base to the stalk, dark green, and shiny on the upper side, paler below, quite glabrous : nerves irregular about four pairs, commonly with small perforated swellings in the axils. Flowers in regular decussately branched panicles, terminating the branches and in the upper axils, fragrant : peduncle 1 to 1$\frac{1}{2}$ inches : ultimate pedicels $\frac{1}{30}$ inch or less. Buds globular $\frac{1}{20}$ inch. Corolla $\frac{1}{6}$ inch across, nearly flat ; the petals rounded, $\frac{1}{16}$ inch bent back. Calyx half as long. Stamens as long as the petals, spreading outwards ; anthers round. Style very short, compressed laterally, green. Fruit a green drupe, $\frac{1}{2}$ by $\frac{1}{4}$ inch. Seed with a groove on one side, and thick horny endosperm. As they fade the petals and stamens turn a pale brown colour

and remain, not falling quickly : not so in Ligustrum. t. 328.

Nilgiris : in sholas on the Western plateau. Pulneys : Gundattu shola.

O. polygama *Wt.* differing from the above in the flowers polygamous (some male only, some female only, some both) and broader leaves occurs on the road between Avalanche and Sispara [*G.F.M.P.*].

LIGUSTRUM. F.B.I. 92 IX.

Privet.

Shrubs and small trees with opposite, simple, uncut leaves, and terminal panicles of small white or cream-coloured flowers of four united petals. Fruits, drupe-like, with one seed only enclosed in a horny endocarp, the embryo having its radicle pointing upwards.

Species 30, mostly in Asia, 14 belonging to China.

Corolla tube twice as long as the calyx . . . . L. Perottetii.
Corolla tube shorter than the calyx. . . . . L. Roxburghii.

Name said to be from LIGO *= I tie (ligamentete) because of the very flexible branches.*

Ligustrum Perottetii *DC.*, *including* L. neilgherrense *Wight*; *F.B.I.* iii 615, IX 4 & 5 ; Privet on the western downs. A small shrub, growing often in dense tufts 5 feet high and more wide on the Eastern plateau, a tree flowering profusely with panicles of fragrant white flowers, the corolla tubes much longer than the very small calyx, the petals $\frac{1}{4}$ inch long, curled back. Branches smooth with small lenticels. Leaf stalk $\frac{1}{6}$ inch : blade 1 to $1\frac{1}{4}$ by $\frac{3}{4}$ to 1 inch, quite glabrous, but hardly shiny, ovate, acute at both ends : nerves about six pairs, joining

each other inside the margin. Young leaves however sometimes 5 by $1\frac{1}{4}$ inches. Panicles 2 to 4 inches by $1\frac{1}{2}$ to 2 inches : lower bracts leaf-like, upper $\frac{1}{8}$ inch : branches with three or four pairs of sessile flowers in the axils of minute bracts. Corolla tube $\frac{1}{10}$ inch, or more, longer than the calyx, broadening above and in bud club-shaped ; lobes $\frac{1}{8}$ inch by $\frac{1}{16}$ inch, spreading. Stamens inserted at the top of the tube ; filaments distinct though short ; anthers opening inwards. Fruit, black, obovate-oblong or long egg-shaped, $\frac{1}{3}$ by $\frac{1}{6}$ inch, seated on the dried calyx, on a $\frac{1}{8}$-inch stalk ; usually in pairs. **t. 329.** Wight Ic. tt. 1243 and 1245 ; Sp. Nilg. t. 148.

In the open as thickets and by sholas. Nilgiris : on the downs especially near water. A fine clump by the turning to Sholur near Sandy Nullah and abundant at head of Parson's valley.

Wight (Ic. note on tt. 1243 and 1244) distinguishes L. Perottetii, a small bush widely diffused, from L. neilgherrense, a large more local plant. I am unable to separate his specimens and reduce therefore the second species.

Nor am I able to separate, except by its size, the eastern and the western forms, but those having the south-west monsoon or summer rains are decidedly smaller than those having the north-east monsoon or winter rain. Most of the Coonoor trees seem to be this species.

Ligustrum Roxburghii *C.B. Clarke ; F.B.I.* iii 615, IX 3. A small tree distinguished from the last species by its large and acuminate leaves, compound leafy panicles, and invisible corolla tube. Leaves elliptic, acuminate, narrowed to the base, about 6 to 2 inches. Veins 8 to 12 pairs. Panicles axillary and terminal, forms large leafy compound panicles, corolla tube short, distinct to calyx tube.

Nilgiris : Coonoor and lower levels. Shevaroys : Green Hills. Pulneys.

APOCYNACEÆ.

Herbs or trees, with milky juice and opposite leaves, without stipules. Flowers in cymes, axillary or terminal, often clearly dichotomous. Corolla of 5 lobes, twisted in bud. Stamens on the corolla tube with narrow or sagittate anthers. Ovary of 2 free or 2 united carpels, but one style only, with usually a large drum-shaped stigmatic head. Fruit a pair of follicles or a double drupe or berry. Seeds in the follicles often with hairs or wings.

Species about 1,000, all over the world but chiefly in the tropics.

Well-known plants of this order are Vinca major *L.* and Vinca minor *L.*, the Periwinkles of England. And in India: V. rosea *L.* with pink or white flowers, common in sandy gardens; Nerium oleander with single or double pink or white flowers, and Wrightia tinctoria *Br.* with white flowers and pairs of long slender curved black follicles united at the tip. Several others are cultivated in gardens.

CARISSA. F.B.I.

Shrubs sometimes armed with pairs of axillary spines. Leaves opposite entire glossy. Flowers axillary. Fruit fleshy.

Carissa paucinervia *A. DC.; F.B.I.* iii 631, VI 3. A small much-branched shrub, glabrous except the petiole and cymes, and with large, often forked spines. Leaves 1 to 1½ inches, elliptic oblong to lanceolate, acute at both ends, mucronate, coriaceous; veins obscure. Peduncles very short, three to five-flowered; corolla $\frac{1}{6}$ to $\frac{1}{3}$ inch white or tinged with pink, very fragrant, lobes narrow. Fruits $\frac{1}{5}$ inch ellipsoidal. **t. 330.**

Nilgiris: Coonoor, Biccapatti, Kotagiri, etc., on the Eastern plateau.

The spines are the lateral branches of a bud, which has otherwise not developed. The leaves of a pair under a pair of spines are often larger than the others. In the flowering region, a flower-bearing peduncle replaces the spine.

Except for its spines and its milky juice, this plant much resembles Jasminum rigidum (p. 387).

RAUWOLFIA. F.B.I 94 VII.

Shrubs with leaves in whorls of 3 or 4. Corolla salver-shaped with slender tube and constricted mouth. Anthers small, rounded at the base. Carpels distinct. Fruit of two distinct or united drupes, each 1-seeded.

Species about 40, chiefly American.

Rauwolfia densiflora *Benth.*; *F.B.I.* iii 633, VII 3. Leaves obovate or oblanceolate, shortly acuminate, about 4 by 2 inch, with 8 to 16 regularly disposed pairs of lateral nerves. Flowers white, in much bifurcating corymbose cymes. Corolla tube inflated at the top. **t. 331.**

Nilgiris; in light sholas near Coonoor and Kotagiri; common flowering summer months, the white flowers very conspicuous.

ASCLEPIADACEÆ.

Herbs usually climbing, with milky juice, and opposite simple often cordate leaves. Flowers quite regular; of five calyx-points, five corolla lobes, five stamens, two separate carpels with short styles connected only by the large stylar head, and for fruit two follicles filled with flat oval seeds, each with a dense tuft of long white hairs. The very short styles completely encased by the anthers which have very short filaments and join each other round it. Anther lobes of a stamen separated by a broad connective on the back of which, or on the base of the corolla, are developed swellings, collectively termed

the *corona.* Pollen in each anther-cell or pollen-sac aggregated into one lump (or occasionally two) called a *pollinium,* and the polliniums of two adjacent anther-lobes (of different anthers) connected, at the top in some species at the bottom in others, by an inverted λ-shaped piece usually black, termed the *translator* or *gland.*

Species 1,000 chiefly in the tropics.

Cross-pollination is effected by insects crawling over the flower and dragging a leg through the crevice between two adjacent anther-cells and removing the two polliniums connected by the λ-shaped translator which fits astride the leg.

KEY TO THE GENERA.

a { Corolla with bulbous base and narrow tube widening to a hemispheric or conical crown with five openings. *p.* 400. CEROPEGIA.
Corolla open, flat or nearly so . . . . *b*

b { Flowers in axillary umbels . . . . *d*
Flowers in racemes or extended cymes, backs of anther enlarged . . . . *c*

c { Cymes bifurcating, corolla with 5 small scales . . *p.* 395. BRACHYLEPIS.
Cymes slender, zigzag, no corolla scales. . . . . . *p.* 397. TYLOPHORA.

d { Steam leafless, jointed . . . . *p.* 396. SARCOSTEMMA.
Leaves cordate . . . . *e*
Leaves ovate or oblong, or narrow . . . . *f*

e { Corolla ¼ inch yellowish; corona as a thickening at each fold touching the white-domed central column, stem and leaves brown-hairy . *p.* 396. GYMNEMA.
Corona as a waxy cup outside the stamens, above the reflexed corolla lobes . . . . *p.* 395. CYNANCHUM.
Corona as 5 rounded or obovate lobes, flat topped. Flower green . . . . *p.* 399. MARSDENIA.

f { Corona as a flat five-rayed star, pink: petals white, waxy . . . . *p.* 399. HOYA.
Each part of corona wrapping round the base of a curved horn-like upward extension . . . *p.* 404. ASCLEPIAS.
Corolla pale yellow, ⅓ inch . . . . *p.* 396. GYMNEMA.

BRACHYLEPIS.

Climbing hairy shrub characterized by the small purplish-brown flower being in dichotomously branching cymes. Anthers with broad backs, between which are five U-shaped spaces fringed with white, while opposite each arm, on the corolla, are five flat scales. Pollen masses oval or wedge-shaped on short stalks attached in pairs to a white disc in each U-shaped space. Pods widely divergent pointed.

Brachylepis nervosa *W. and A.; F.B.I.* iv 7, IV 1. A fairly, stout climbing shrub with light brown, hairy branches. Leaves broadly elliptic or ovate shortly acuminate, about 3 by 2 inches, coriaceous, dark green, glabrous and glossy on the upper side. Stalk, midrib and about 10 pairs of veins often purple. Flowers $\frac{1}{6}$ inch diameter, greenish outside, purplish inside with yellow centre; in terminal or axillary very hairy dichotomous cymes with closely set triangular bracts. Pods $2\frac{1}{2}$ to 3 inches, black, opening out into one straight line. **t. 332.**

Nilgiris: On the Eastern plateau from Wellington to Kotagiri and Kodanad and on the slopes below Coonoor in sholas. Flowering summer.

Gen. Dist. Only these hills.

CYNANCHUM. F.B.I. 95 XXVI.

Twining plants with rather slender stems, opposite leaves and small greenish flowers, in which the corona is in the form of a white wavy cup, and the pollen masses are solitary in their cells (ten in all) and pendulous (the translator being at the top).

Species about 100.

Cynanchum alatum *W. and A.; F.B.I.* iv 23, XXVI 5. Leaves nearly oblong, deeply cordate at the base, 1 to 2 by $\frac{1}{2}$ to $\frac{1}{4}$ inch, acute glabrous. Peduncles of umbels $\frac{1}{6}$ inch; pedicels $\frac{1}{3}$ inch. Flowers $\frac{1}{4}$ inch diameter. Pod $1\frac{1}{2}$ to 2 inches. **t. 333.**

Nilgiri and Pulney pleateaus, not uncommon.

SARCOSTEMMA. F.B.I. 95 XXVII.

Leafless plants with thin cylindrical green stems. Flowers in umbels. Corona a membranous cup. Follicles smooth, straight. Seeds margined.

Species few.

Sarcostemma brevistigma *W. and A.; F.B.I.* iv 26, XXVII 1. Stem as thick as an ordinary wooden penholder, with joints 4 to 6 inches apart. Umbels terminal sessile, 1 to $1\frac{1}{2}$ inches diameter. Pedicels $\frac{1}{2}$ inch. Flowers $\frac{1}{3}$ inch, greenish white. Follicles 4 to 5 by $\frac{1}{3}$ inch. Seeds flat, $\frac{1}{6}$ to $\frac{1}{4}$ inch. **t. 334.**

Nilgiris: at about 5,000 feet and below on rocks. Dolphin's Nose near Coonoor, etc.

Gen. Dist. Deccan and plains in dry places.

GYMNEMA. F.B.I. 95 XXX.

Herbaceous or woody slender twining plants with opposite leaves and axillary peduncled umbels (or umbel-like cymes) of shallow or cup-shaped monopetalous flowers with petals overlapping to the right. Corona lobes thick and adnate to the corolla as ridges between the lobes; centre of column a white dome. Polliniums solitary in each cell (ten in all) erect on minute honey carriers. Follicle terete, slender.

Species 28 in tropical and sub-tropical regions of Africa, Asia and Australia.

A slit (the separation of the anthers) extends down below each minute brown carrier and may give the impression that the pollinia are pendulous. But on removal of the carrier by a fine needle they will be found erect. A good glass is required.

KEY TO THE SPECIES.

Leaves cordate at base, rusty tomentose below; flowers $\frac{1}{6}$ inch; brownish yellow . . . . . . G. hirsutum.
Leaves oblong, rounded at base, glabrous coriaceous, flowers pale yellow, larger . . . . G. montanum.

Gymnema montanum *Hooks; F.B.I.* iv 31, XXX 11. Glabrous; leaves oblong or oblong lanceolate, shortly acuminate, rounded at the base. Corolla about $\frac{1}{3}$ inch, pale yellow, pubescent on the outside.

Nilgiris: Naduvattam.

Gen. Dist. Western Ghauts, 4,000 to 7,000 feet.

Gymnema hirsutum *Wight and Arnott; Wight Herb. Prop.! ; F.B.I.* iv 29, XXX 2. A fairly stout twiner, all green parts covered with soft brown pubescence, specially dense on the stem. Leaf-stalks $\frac{1}{4}$ inch; blades $1\frac{1}{2}$ to $2\frac{1}{4}$ by 1 to $1\frac{1}{4}$ inches, ovate acute or cuspidate. Cymes subsessile. Sepals $\frac{1}{20}$ inch. Corolla $\frac{1}{4}$ inch, yellowish-brown; lobes spreading, thickened and ciliate. Follicles $1\frac{1}{2}$ inches, slender, glabrous. **t. 335.** Wight Ic. tt. 1271 and 1272.

Nilgiris: near Ootacamund, both plateaus, Pykara to Coonoor and Kodanad common. Not on the upper Pulneys. Not recorded with certainty elsewhere.

TYLOPHORA. F.B.I. 95 XXXVI.

Herbaceous or woody slender plants, usually twiners, with opposite leaves and loose racemes (simple or branched) of small flowers with petals overlapping slightly to the right and spreading out flat. Coronal processes thick

and fleshy, with short free tips, bending inwards and broadening outwards, attached to the stamens but free of the corolla. Anthers erect on very short filaments with membranous inflexed tips : polliniums one in each cell (ten in all), erect, minute. Follicle acuminate, smooth.

Species 40 in the tropical and sub-tropical regions of Asia, Africa and Australia, New Caledonia and Norfolk Isles.

a	Stem twining	*b*
	Stem more or less erect : flowers dark purple.	T. Iphisia.
b	All green parts softly hairy	T. mollissima.
	All parts glabrous	T. tenuis.

Tylophora mollissima *Wight, Herb. Prop.* 1540*!* "1837" *! ; F.B.I.* iv 43, XXXVI 16. Softly hairy in all green parts. Leaf-stalks $\frac{1}{8}$ to $\frac{1}{2}$ inch : blades $1\frac{1}{2}$ to $2\frac{1}{2}$ by $\frac{1}{3}$ to 1 inch, oblong lanceolate, acute. Racemes 2 to 4 inches, zigzag, with two or more flowers at the bends on very slender $\frac{1}{8}$ inch pedicels. Flower $\frac{1}{6}$ inch. Fruit not seen. **t. 336.**

Nilgiris : Kotagiri. Pulneys : shola by Pamban stream. Possibly not truly on the plateau.

Gen. Dist. Nowhere else, but closely allied to T. hirsuta of Assam, Khasia and Himalayas.

Tylophora tenuis *Bl. ; F.B.I.* iv 42, XXXVI 13. Stems slender. quite glabrous. Leaf-stalks $\frac{1}{6}$ inch ; blades lanceolate with rounded base, 1 to $2\frac{1}{2}$ by $\frac{1}{2}$ to $\frac{3}{4}$ inch : nerves few, indistinct. Racemes 2 inches with two or three bunches of small dark purple flowers on stalks of $\frac{1}{4}$ to $\frac{1}{2}$ inch. Follicles $2\frac{1}{2}$ to 3 inches, slender lanceolate. **t. 337.**

Pulneys : Kodaikanal and below, but properly belongs to lower levels, e.g., Kotagiri, Shembaganur.

Gen. Dist. On the plains of Bengal near Calcutta to Ceylon. Burma and Malacca.

Tylophora Iphisia *Dcn.; F.B.I.* iv 40, XXXVI 5. A stout more or less erect plant. Leaves ovate or lanceolate, acuminate. Corolla lobes ovate. Corona adnate to the large anthers: pollen carrier long, narrow, with very slender stalks to the pollinia. Pod 3 to 4 inches lanceolate.

Nilgiris: 6,000 to 7,000 feet [*G.F.M.P.*].

MARSDENIA (*formerly* DREGIA).

Climbing shrubs with opposite cordate acuminate leaves and comparatively large green flowers in axillary umbels. Corona in the form of 5 flat ovate masses, narrowed at their inner ends, broad and rounder at the outer. Polliniums ten in all, erect. Pods hard thick.

Species few in India, Malaya and tropical Africa.

Marsdenia volubilis *T. Cooke;* formerly Dregia volubilis *Benth.; F.B.I.* iv 46, XXXIX 1. A tall stout climber on even large trees. Bark brown, rough. Leaves 3 to 6 inches, broadly ovate, cordate acuminate. Peduncles as long. Umbels drooping of numerous green flowers. Petals triangular, $\frac{1}{4}$ inch long. Pods 3 to 4 inches by 1 to $1\frac{1}{2}$. Smooth and black outside, pale straw-coloured and glossy inside. Seeds $\frac{1}{8}$ inch, black, flat. Wood white soft. **t. 338.**

Nilgiris: Coonoor on Lamb's Rock Road, Droog, etc., common. Flowers summer months.

HOYA. F.B.I. 95 XLIV.

Woody climbers with thick leaves, and umbels stalked in one only of a pair of opposite leaf-axils. Flowers medium or large sized, not small: corolla lobes valvate (not overlapping) in bud and spreading out flat (stellate),

very thick and waxy. Corona of five thick flat lobes. Anthers with membranous erect or inflexed tip. Polliniums solitary (ten in all), erect. Pods slender, pointed.

Species about 60 in the hotter parts of Asia and Australia; most abundant in the Malay Archipelago. Some cultivated in gardens for their waxy-looking flowers.

Hoya Wightii *Hook. f.* 1522 and 2213; *F.B.I.* iv 59, XLIV 32.

Stem thinner than a lead pencil, glabrous. Leaves elliptic but variable, very thick, shortly stalked. Peduncles 1 inch stout. Pedicel $\frac{1}{2}$ to $\frac{3}{4}$ inch. Flowers $\frac{3}{4}$ inch. Petals white; coronal lobes obovate obtuse pink or purple. Follicles brown. **t. 339.**

Pulneys: by the Pamban stream. Nilgiris and Mangalore. *Wight.*

CEROPEGIA. F.B.I. 95 L.

Distinguished from all other plants by the corolla—a tube narrow in the middle, inflated at the base (round the ovary and stamens), and enlarged again at the tip and there closed in except for five lens-shaped openings.

Herbs or woody plants with tuberous rootstock and opposite ovate lanceolate or linear (not cordate) leaves. Flowers in axillary peduncled, umbel-like cymes. Corolla tube dilated at the base and apex: lobes five, connate by their tips (and thus leaving openings between). Corona five or ten-lobed, with five scales or processes inside opposite the anthers. Anthers incumbent on the stylar head, without membranous tip. Pollen masses one in each anther-cell (ten in all), erect, sessile. Follicles slender, smooth, terete.

Species 80 in tropical Asia, Africa, Australia and South Africa.

a { Stem short, erect from a spherical tuber . . C. pusilla.
Stem slender, twining . . . . *b*

b { Dome of corolla hemispheric : ten coronal lobes and five processes inside, all linear and equal . . . C. elegans.
Dome of corolla longer than broad : processes (inner coronal lobes) five, longer than the outer . . . . *c*

c { Leaves glabrous . . . . *d*
Leaves and peduncles hairy . . . . *e*

d { Corolla $\frac{3}{4}$ to $1\frac{1}{4}$ inches ; outer coronal lobes very small . . C. intermedia.
Corolla 2 to $2\frac{1}{4}$ inches; outer coronal lobes not much shorter than the inner processes . . . . C. Thwaitesii.

e { Flowers 1 by $\frac{1}{8}$ inch, peduncles 3 to 6 inches . C. ciliata.
Flowers 1 inch by $\frac{1}{4}$ inch, peduncle $\frac{1}{2}$ inch . C. hirsuta.

Ceropegia pusilla *Wight ; F.B.I.* iv 66, L. 1. Stem erect, 2 to 5 inches, rising from a tuber 1 inch or more broad, and slightly flattened. Leaves crowded, 1 to 3 by $\frac{1}{10}$ to $\frac{1}{3}$ inch, with one strong nerve, erect, minutely scabrous on the midrib and margins, otherwise glabrous ; stem very distinctly swollen at the nodes. Peduncle usually displaced to one side of its subtending leaf, and with a very small linear bract at the base, $1\frac{1}{2}$ inches, erect, slightly pubescent. Flower solitary as a rule, erect. Sepals $\frac{1}{8}$ to $\frac{1}{4}$ inch, linear. Base of corolla $\frac{1}{3}$ by $\frac{1}{5}$ inch, ovoid : tube $\frac{1}{2}$ by $\frac{1}{10}$ inch, five-angled : dome portion $\frac{1}{4}$ by $\frac{1}{5}$ inch, the lobes $\frac{1}{20}$ inch wide, the openings a longish diamond shape, glabrous. Corona dark purplish brown, with ten dark purple, white-ciliate, teeth $\frac{1}{50}$ inch long, and five linear processes $\frac{1}{16}$ inch, meeting above the yellow central mass. Stamens thick, erect and separate from the stylar head except at the base : polliniums erect, attached in pairs at the base. Follicles 2 inches, swollen in the middle. **t. 340.** Wight Ic. t. 1261.

In the grass of the down, coming up after the first rains.

Nilgiris : on the downs, Ootacamund to Pykara ; flowering May or July.

Gen. Dist. Also on Anamalais (*Beddome*). Not seen on Pulneys.

Ceropegia elegans *Wall.* and *Cat.* 8138 ! and *Cat.* 8133 (*C. elegans*) ; *Wight's Herb. Prop.* 1513 *!* ; *F.B.I.* iv 68, L 10. Stem very slender running in grass or climbing on shrubs, quite glabrous. Leaves 1¼ by ½ (⅓ to ⅝) inch, lanceolate or ovate-lanceolate, acute or shortly acuminate, glabrous : stalk ¼ inch. Flowers solitary, or pedicelled two or three together, on axillary peduncles of ¼ inch. Sepals linear, ⅛ inch, green. Corolla 1 to 1¼ inches : crown hemispheric, broader than the base, green blotched with dark purple ; its lobes ciliate with dark purple hairs and emerald green where they meet in the centre ; junction of the tube and basal part inside with white hairs. Coronal lobes ten, linear clavate ; inner processes nearly or quite as long as them, linear, glabrous (fifteen linear structures in all). Follicles 2 to 9 inches, very slender, terete : seed usually ½ inch, linear, convex on one face, deeply grooved on the other. The buds are erect, but the mature flower hangs down and opens sideways. **t. 341.** Wight Ic. t. 1265.

Nilgiris : Eastern plateau, Kotagiri. Kodanad, etc. Pulneys : below Kodaikanal at Shembaganur.

Gen. Dist. of "C. elegans *Wall.*" in *F.B.I.* : "Malabar and Travancore mountains from Nilgiris to Ceylon."

I find in my specimens the coronal lobes as long as the five inner processes. Wallich in Bot. Mag. t. 3015, where the species C. elegans was first described, shows them shorter. His Cat. 8135, the type plant, appears to be hardly the same as his Cat. 8138, nor as Wight's Herb Prop. 1513, which are the types of C. sphenanantha *W.* and *A.*, which I gave as the name of this plant in the Fl. N. & P. Ht.

Ceropegia intermedia *Wight ; F.B.I.* iv 71, L 19. Stem slender but stouter than in C. elegans. Leaf-stalk $\frac{1}{2}$ inch : blade 2 to $2\frac{1}{2}$ by $\frac{1}{2}$ to $\frac{3}{4}$ inch, lanceolate, acute at both ends. Flowers $\frac{3}{4}$ to $1\frac{1}{4}$ inches in axillary irregular umbels : peduncle 1 inch : pedicels $\frac{1}{2}$ inch, very slender. Corolla tube 1 inch : lobes $\frac{1}{2}$ inch or less forming a conical crown. Coronal lobes short or absent. Inner processes five, long ($\frac{1}{12}$ inch), dilated upwards.

Pulneys : on the slopes above Shembaganur, and in that valley, Poombari ; flowering in June.

Gen. Dist. Ceylon and Courtallam (*Wight*) ; Anamalais (*Beddome*).

Ceropegia Thwaitesii *Hook. ; F.B.I.* iv 71, L 20. Very similar in habit to C. elegans *Wall.* Leaves twice to four times as long as broad, acuminate about 4 inches by 1 to 2 inches. Flowers like those of C. intermedia but twice as large, $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long, and the coronal processes (5) not dilated upwards, pale green with purple patches : dome of flower taller than broad, lobes glabrous. Pods 6 to 8 inches long, with hooked tip and long seeds. **t. 342.**

Pulneys : Kodaikanal.

Gen. Dist. Ceylon and Tinnevelly hills.

The relative lengths of the coronal lobes and processes vary as also in C. elegans *Wall.* I take this to be Hooker's plant but if it is the figure in Bot. Mag. t. 4758 it is not good.

Ceropegia ciliata *Wt. ; F.B.I.* iv 72, L 23. A much smaller species than the preceding. Leaves linear-lanceolate to lanceolate, $1\frac{1}{2}$ to 2 inches by $\frac{1}{4}$ to $\frac{1}{2}$ inch, hispidly hairy on both surfaces. Peduncles nearly as long, hispid ; as also the $\frac{1}{3}$ inch pedicels and calyx. Corolla slender, $1\frac{1}{4}$ inches by $\frac{1}{8}$ inch, pale purple ; lobes $\frac{1}{3}$ inch forming a narrow dome, glabrous. Coronal lobes hairy, processes longer. **t. 343.**

Nilgiri and Pulney plateaus in grass. Nilgiris. Flowers September.

Ceropegia hirsuta *W. & A.; F.B.I.* iv 71. Stem leaves and peduncles hairy. Flowers 1 to 1¼ inches, greenish with purple spots and reddish purple crown; base small tube ¾ inch expanding gradually to the ¼ inch crown. Leaves variable more or less lanceolate.

Shevaroys: near Yercaud.

Gen. Dist. From Ganjam southwards to the Anamalais.

ASCLEPIAS. F.B.I. 95 XIXX.

The corolla is deeply lobed, often reflexed. The corona lobes are concave curculate, or horse-shoe shaped with opening inwards, and sometimes have a horn projecting from inside. Pod inflated.

Species about 60 nearly all American.

Asclepias physocarpa *Schlect.* With very narrow upright leaves and no horn in the corona lobe and inflated. Pods 2 by 1 inch or more; occurs in and about Kotagiri.

A. curasavica *L.* with orange flowers and a horn in each corona lobe is grown often in gardens.

LOGANIACEÆ.

Leaves opposite with stipules or a stipular line. Flowers perfectly regular: sepals, corolla lobes, and stamens four or five. Ovary superior, two-celled. Fruit a berry or dry and septicidal. Trees, shrubs, climbers or herbs. Somewhat resembles the APOCYNACEÆ but for the stipules, the completely united ovary and the absence of a milky juice.

Species about 400.

Two species of Buddleia are cultivated in English gardens. Strychnine was prepared originally from the fruit of Strychnos nux-vomica, a native of the.

Stout shrub with large creasy flowers . . . . . FAGRÆA.

Climber with yellow flowers. . . . . GARDNERIA.

GARDNERIA. F.B.I. 96 VIII.

A genus of two or three species or perhaps one only, natives of India and Japan.

Gardneria ovata *Wallich, Cat.* 816 *! ; F.B.I.* iv 93, VIII 1. A very common woody climber, with yellow waxy flowers in the centre of which stands a hard cone of anthers ; and brilliant red berries.

Tall climber, stem round, smooth, rather stiff, about $\frac{1}{6}$ inch thick. Leaves opposite connected by a line across the axis : stalk $\frac{3}{4}$ inch : blade 3 by $1\frac{1}{2}$ to 4 by $2\frac{1}{2}$ inches, broadly elliptic or obovate, acute, coriaceous, with entire waved margin, and veins impressed on the upper side. Flowers in cymes of three, peduncled in the leaf-axils : peduncles $\frac{1}{2}$ to $\frac{3}{4}$ inch : pedicels as long, with two minute bracteoles half-way up : buds $\frac{1}{5}$ by $\frac{1}{6}$ inch. Calyx small, deeply lobed. Corolla rotate, the tube very short : petals five, $\frac{1}{5}$ by $\frac{1}{8}$ inch, yellow, waxy and thick, reflexed ; in bud valvate. Stamens five, attached to the corolla tube, but anthers nearly sessile, opening inwards and connivent to form a hard cone conspicuous in the centre of the flower. Berry $\frac{1}{4}$ inch, scar surmounted by the $\frac{1}{16}$ inch style, two-celled, and two-seeded. Seed compressed parallel to the division wall. **t. 344.** Wight Ic. t. 1313.

On shrubs and trees in sholas, very common on the Nilgiri plateau, flowering in April and May.

Gen. Dist. Also Nepal and Khasi hills.

The species was founded on a Nepal plant and the type sheet, Wallich Cat. 816, from Sylhet, has larger more acuminate leaves and large panicles up to 6 inches long, with ten pairs of three-flowered cymes : but it has also in some leaf-axils only one such cyme, as seems with rare exceptions to be the case with the Nilgiri examples.

FAGRÆA. F.B.I. 96 IV.

Trees or shrubs with opposite leaves, with prominently dilated leaf-bases or stipules. Corolla lobes twisted. Fruit a berry.

Species about 20, from India to Australia.

Fagræa obovata *Wall.* ; *F.B.I.* iv 83, IV 5. A low tree or shrub. Leaves 6 by 3 inches, obovate quite glabrous ; midrib prominent lateral veins obscure bracts and bracteoles conspicuous, buds ovoid, green. Corolla tube 1½ by ½ inch expanding into a broad five-lobed limb, 1½ to 2 inches across, creamy white. Berry ½ by 1 inch. **t. 345.**

Nilgiris : On the borders of plateau, Kodanad, Coonoor by the river just above the railway station. Lamb's Rock Road. Dolphin's Nose, etc., Kodanad, flower May.

Gen. Dist. Deccan and Ceylon.

GENTIANACEÆ.

Herbs with opposite entire glabrous leaves and perfectly regular flowers of five sepals, corolla lobes, and stamens ; but characterized by the petals being in bud twisted over each other to the right, and the ovary having two parietal placentas (which do not as a rule meet to make it two-celled) and ripening to a many-seeded capsule opening in two valves.

Species 550, all over the globe, mostly on mountains.

a { Petals pale blue, each with a small scale at the base . . . *p.* 410. SWERTIA.
Petals pinkish, spurred behind . . . . *p.* 411. HALENIA.
Flowers bright or deep blue . . . . *b*

b { Corolla folded and twisted : small herb. *p.* 409. GENTIANA.
Petals twisted, not folded : tall herb . . *p.* 407. EXACUM.

EXACUM. F.B.I. 97 II.

Characters as above for the family, but ovary completely divided into two cells and corolla deep blue. Mostly very handsome plants, the flowers blue.

Species 20 mostly in India.

KEY TO THE SPECIES.

a { Sepals and petals 5 . . . . *b*
Sepals and petals 4 . . . . *c*

b { Stem winged : flowers many . . . . E. Wightianum.
Stem hardly winged : flowers few. E. atro-purpureum.

c { Flowers rose or blue : sepals gradually acuminate . . . E. Perrottetii.
Flowers white with blue tips : sepals cuspidate . . . . E. bicolor.

Exacum Wightianum *Arnott ; F.B.I.* iv 97, II 9 ; Giant Field Gentian. A tall well-branched and leafy plant ; stem, at base as thick as the middle finger, square, with wings $\frac{1}{16}$ inch broad decurrent from the leaf-margins, glabrous 1 to 3 feet high, branched. Leaves 2 to 5 inches, lanceolate acute narrowed at the base to a broad $\frac{1}{4}$ inch stalk : nerves three strong with another fainter pair outside near the margin. Flowers in the upper axils a deep violet blue, facing sideways. Stalks $\frac{3}{4}$ inch erect in flower, longer and curved down in fruit. Calyx divided to the base, the sepals $\frac{1}{2}$ inch, with a wing down the back $\frac{1}{8}$ to $\frac{1}{6}$ inch wide. Corolla lobes 1 inch, ovate or oblong, contracted to the mouth of the short roundish tube. Stamens $\frac{1}{5}$ to $\frac{1}{4}$ inch,

not much narrowed to the top, and "with a minute papilla on the connective behind." Fruit egg-shaped, ½ inch. t. 346.

On the open downs. Nilgiris : Coonoor. Pulneys at 7,000 feet near Kodaikanal and below. Coonoor.

Exacum atropurpureum *Beddome, var.* **anamallayanum** ; *F.B.I.* iv 97, II 7. A handsome bushy plant. Stem smooth, terete or four-angled, but not winged. Leaves 1 to 2 inches by ⅞ to 1¼ inches, broadly ovate or oblong-elliptic : base clasping : apex blunt or with small cuspidate point : margin thickened : nerves three strong from the base and an outer fainter pair. Flowering part decussately branched, with flowers pedicelled in the uppermost axils on stalks of ½ inch. Calyx ½ inch, strongly winged : lobes triangular equal to the tube. Corolla 2½ inches, deep rich blue : lobes oblong-obovate cuspidate : tube very short. Anthers ¼ inch, attached firmly at their bases narrowed upwards. Fruit globose ⅓ inch, two-celled with many seeds, opening by two opposite slits and surrounded by the persistent winged calyx. t. 347.

Pulneys : on the downs on rocks near or in water ; flowering June. Not on the Nilgiris.

Gen. Dist. Also Anamalais and Malabar. The type species has the leaves rounder and without margin, and occurs also in Quilon (*Wight*).

Exacum bicolor *Roxb.* ; *F.B.I.* iv 96, II 4. A herb 12 to 20 inches. Lobes of corolla half white, half (the tips) blue or violet. Buds curved. Anthers ½ inch curved and tapering. Pedicels ½ inch. Peduncles usually larger—axillary and terminal. Bracts narrow. Sepals ovate, abruptly cuspidate. Leaves lanceolate five-veined. t. 348.

Nilgiris : Naduvattam, flower September.

Gen. Dist. N. Circars to Coimbatore hills up to 4,000 feet. Roxburgh's species was founded on a Ganjam plant.

E. Perrottetii *Griesb.* ; *F.B.I.* iv 95, II. Flowers rose-coloured or blue, the parts in fours rather larger than in the last species. Peduncles and pedicels $\frac{1}{2}$ to 1 inch, terminal and axillary. Bracts narrow lanceolate. Sepals ovate lanceolate, keeled, tapering to the point, not abruptly cuspidate. Anthers oblong, shorter than in the last. Leaves ovate, five-veined.

Nilgiris : about Coonoor and Kotagiri [*G.F.M.P.*].

Gen Dist. Mahendragiri (Ganjam) to the Nilgiris.

I have not seen this species. The dark-tipped petals of E. bicolor fade to an even mauve colour, and this fact taken with the slight differences between these species makes it difficult to be certain of them.

GENTIANA. F.B.I. 97 IX.

Herbs, with the characters of the family, often small : distinguished by the corolla lobes being in bud folded inwards and then twisted, the tube not very short, with the stamens attached to it.

Species about 300, chiefly on the mountains of the Old World, a few on the Andes of South America and in New Zealand and Australia. Well known in Europe for their brilliant blue flowers. *Ger.* Enziane.

Gentiana pedicellata *Wall. var. Wightii Kurz.* formerly G. quadrifaria *Bl.*, *var.* zelylanica ; *F.B.I.* iv 111, IX 12. Tap root strong. Radical leaves in a rosette, obovate, 1 by $\frac{1}{3}$ inch, with numerous stems in their axils, bearing $\frac{1}{4}$ inch ovate or lanceolate leaves, and solitary terminal flowers. Bud $\frac{1}{2}$ inch long. Corolla $\frac{3}{4}$ inch, of 10 lobes, 5 long, 5 shorter, bright blue. Fruit a capsule $\frac{1}{5}$ by $\frac{1}{8}$ to $\frac{1}{6}$ inch. Seeds globose or obovoid, trigonous, smooth (*Clarke*). **t. 349.**

Nilgiris: Common in grass all over the downs, perhaps especially at the lower limits of our area.

Gen. Dist. Of G. quadrifaria *Bl.*, Himalayas from Kashmir to Bhotan., Khasia, Ceylon, Burma, Java, China.

Kurz separated the Indian form placed in G. quadrifaria *Bl.* in F.B.I., and restored Wallich's name pedicellata. G. quadrifaria *var.* zeylanica is now reserved for the Mysore plant.

SWERTIA. F.B.I. 97 XII.

Herbs with the general characteristics of the family (p. 406) and characterized by the tube of the corolla being very short and lobes (petals) overlapping to the right, and each with a small depression at the base, more or less covered by a hairy scale (a honey gland).

Species 50, Europe, Asia, Africa, chiefly on the mountains.
Nectary at the base of each petal one only . S. corymbosa.
Nectaries in pairs . . . . S. minor.

Swertia corymbosa *Wight ; F.B.I.* iv 126, XII 17. Annual or perennial ; lower leaves more crowded than the upper, and often soon falling. Stem 6 to 18 inches, roundish, but with four ridges decurrent from the edges of the leaves, sparingly branched except in the flowering region. Leaves obovate, sessile, acute or not, strongly three-nerved ; lower 1 by $\frac{1}{4}$ inch, upper narrower and shorter. Flowering branches in the upper axils, two to five pairs, often branched again more than once so as to form a terminal cymose, corymb 3 to 8 inches across ; uppermost divisions short so that the flowers are crowded in umbel-like manner. Sepals narrow, $\frac{1}{4}$ to $\frac{1}{3}$ inch. Petals longer, white or very pale blue with darker veins : pocket at the base of each covered by a scale. Stamens with broad bases attached to the very short corolla tube. **t. 350.** Wight Ic. tt. 1329 and 1330.

On the open downs, very common after the first rains.

Three varieties are given in F.B.I., but I am unable to distinguish them. Difference in the size of the plants and the length of the internodes, making the corymbs contracted or open, appear to be due rather to situation and growth than to an inherited difference. There may be some difference between my Nilgiri and my Pulney specimens, but I am unable to define it with any confidence.

Swertia trichotoma *Wall.; F.B.I.* v 126. Similar to the last but inflorescence elongate, paniculate, corolla lobes acuminate, glands (single) surrounded with long ciliate edges. Leaves up to 3 by 1 inch.

Nilgiris: to 7,000 feet [*G.F.M.P.*].

Swertia minor *Knobe; F.B.I.* iv 120. A small, erect herb with white or blue flowers, small ovate sessile leaves and flowers in leafy fastigiate panicled cymes, the nectaries in pairs, usually with ciliate scales.

Nilgiris: above 6,000 feet in wet places in grass [*G.F.M.P.*].

HALENIA. F.B.I. 97 XIII.

Branched and leafy herbs with the characteristics of the family and distinguished from all others by a short spur behind and at the base of each petal (really an enlarged honey gland *cf.* SWERTIA), and from SWERTIA also by the petals overlapping to the left. Ovary one-celled.

Species 25 to 30 on the mountains of Asia and America.

Halenia Perrottetii *Gr.; F.B.I.* iv 130, XIII 2. Stem slender, annual, glabrous, obscurely winged. Leaves ovate, about 1 by $\frac{1}{2}$ inch, with three main basal nerves and an outer fainter pair. Flowers at the ends, or near the ends, of the quite numerous branches. Sepals $\frac{1}{5}$ inch,

narrowly obovate-obtuse. Petals $\frac{1}{3}$ inch, more or less erect and connivent: spurs $\frac{1}{8}$ to $\frac{1}{6}$ inch, curved upwards, obtuse. Ovary $\frac{1}{8}$ inch, narrowed upwards into the $\frac{1}{8}$ inch style. Seeds $\frac{1}{24}$ inch (*Clarke*). t. **351.**

In shady places, by sholas, etc. Flowers in autumn months. Pulneys: at 7,500 feet on the downs. Nilgiris: flowers in November.

I am unable to distinguish this from H. elliptica *Don*, a Himalayan plant, but Clarke in *F.B.I.* says style longer and seeds much smaller.

BORAGINACEÆ.

Herbs (shrubs or trees) hispid or scabrid, with alternate, mostly entire, simple leaves and small perfectly regular flowers arranged in two rows along one side of slender forked spikes (*scorpioid cymes*), peculiar in being curled up backwards crozier-wise in bud with the flowers facing outwards and upwards as they open and in having no bracts, or a bract opposite to, not subtending, each short pedicel. Flowers with five-toothed calyx: five-lobed monopetalous corolla, imbricate in bud and with the throat of the tube more or less closed with scales: five stamens attached to the corolla tube and alternating with the lobes: and a two-celled ovary with two ovules in each cell, and peculiar in being as a rule deeply divided into four lobes (so that the style rises up in the centre between them), each of which becomes in fruit a *nutlet* containing an erect seed: but in some genera the ovary only slightly notched in two lobes (*as Heliotrope*) or entire and the fruit fleshy.

Species about 1,200 all over the world.

In Europe the tribe BORAGEÆ (with the fruit of four nutlets) is well represented: e.g., ANCHUSA, MYOSOTIS, LITHOPSERMUM, CYNOGLOSSUM.

CYNOGLOSSUM. F.B.I. 100 X.

Houndstongue.

Herbs with the characteristics of the BORAGEÆ (see above) and distinguished by the nutlets being extended downwards below the point of attachment (so that the scar is near the top) and being covered with short hooked spines.

Species 60, in temperate and sub-tropical climates.

Cynoglossum furcatum *Wall., Cat.* 919*!*; *F.B.I.* iv 155, X 1; Houndstongue. Stem 1 to 2½ feet. Leaves 2 by ½ inch; lower larger to 4 inches, upper smaller; hardly stalked, lanceolate or elliptic, acute. Spikes several together terminating the stem and branches, curled back in bud and in flower short (like a Forget-me-not), but in fruit lengthened to 6 or 8 inches; diverging from the stem at about half a right angle. Corolla rotate, blue or pink; lobes five, each with a basal emarginate or two-lobed scale. Fruits at intervals of ½ to 1 inch, facing downwards: sepals ⅛ inch very obtuse, ciliate: nutlets ⅛ inch, covered all over with hooked spines. **t. 352.**

Pulneys: on the open downs, flowering May and June. Nilgiris and Anamalais, down to much lower levels.

Gen. Dist. Mountains of India.

Owing to the lengthening of the spikes as the nutlets mature the flowering and fruiting appearance of the plant are very different.

I find two forms which may possibly be varieties.—

a leaves elliptic quite entire softly hairy. This is possibly the form Clarke in F.B.I. refers to as common on the Nilgiris *Wall.* 919 (Bababoodun, Nepal). *Fyson* 298.

b leaves obscurely crenulate, scabrid with hairs on tuberculate bases. *Fyson* 1843. Possibly Clarke's *var* lanceolata, but not Wallich's Cat. 919.

G.F.M.P. gives two species, neither from our area.

C. furcatum *Wall.* softly hairy leaves, etc., nutlets with distinct margin.

C. dentiulatum *A.DC.* var zeylanicum *C.B. Clarke* leaves strigose with bulbous-based hairs, nutlets not margined covered with glochidiate spines, but on the specimens available to me these two pairs of characters are not segregated in this way and I am inclined to think that our plants shall all be considered one variable species.

CONVOLVULACEÆ. § *Convolvulaceæ.*

Twiners, characterised chiefly by the funnel-shaped lobeless corolla, which in bud is folded in along five lines and then twisted so that when it is open the five areas exposed in bud are of a darker colour. Stamens five, attached to the base of the corolla with oblong anthers dehiscing by slits. Ovary superior of two carpels, two or four celled. Style with undivided or divided, globular or oblong stigma (important for distinguishing the genera). Fruit usually a thin-walled capsule, but also a berry. Leaves always alternate.

Species about 700, mostly in the warmer regions. The genera are so much alike in appearence that their distinction can often be made only by careful examination of the fruit, stigmas, and smaller characteristics.

KEY TO THE GENERA.

a	Style with 2 rounded stigmas	*b*
	Style with 2 oblong stigmas	CONVOLVULUS.
b	Flowers 1 inch or more in cymes or dence bunches . .	*c*
	Flowers ¼ inch in loose racemes or panicles . .	PORANA.
	Fruit indehiscent, often fleshy ovary 4-celled .	ARGYREIA.
	Fruit a thin walled capsule ovary 2-celled . .	IPOMÆA.

ARGYREIA. F.B.I. 101 III.

Flowers in cymes peduncled in the leaf-axils ; stigma globular undivided ; ovary four-celled ; fruit fleshy-indehiscent.

Species about 30, nearly all in India or the Malay Archipelago.

Very similar in general appearance to CONVOLVULUS the common European genus ; but differs from it in the flowers being in cymes not solitary, and from both it and IPOMÆA, the common genus of the plains, in the ovary being four-celled.

KEY TO THE SPECIES.

a { Erect shrub. Flower dark purple . . . A. cuneata.
  { Climbing plants. Flower pink . . . . *b*

b { Fruit orange when ripe . . . . A. hirsuta.
  { Fruit black when ripe . . . . A. nellygherrya.

Argyreia hirsuta *Arnott ; F.B.I.* iv 189, III 18. A strong climber, shaggy with silvery hairs on all the green parts. Leaf-stalks 2 inches : blades 4 by 3 inches, ovate with straight or slightly cordate base. Flowering branches (peduncles) stout, 4 to 7 inches, cymosely forked at the top with short branches so that the flowers are bunched : bracts oblanceolate or oblong, persistent, the outer one often stalked and leaf-like. Sepals linear. Corolla 2½ by 2 inches, pale purple with deep purple centre. **t. 353.** Wight Ic. t. 891 (Rivea).

Nilgiris : Kotagiri, 6,500 feet. Coonoor, etc., flowering May and after. Pulneys : 5,500 feet, etc. Not at high levels.

Gen. Dist. These hills only and Ceylon as var. *coacta*, but very closely allied to other species of South India.

Argyreia nellygherrya *Choisy ; F.B.I.* iv 189, III 16. Similar to the last species but fruits black when ripe.

Nilgiris : to 6,000 feet [*G.F.M.P.*]

Argyreia cuneata *Ker Gawl. ; F.B.I.* iv 191, III 24. An erect shrub with dark purple flowers, about 2 inches by 1 inch and obovate oblanceolate leaves narrow-wedge-shaped at the base. **t. 354.**

Shevaroys : near Yercaud.

CONVOLVULUS. F.B.I. 101 IX.

Mostly herbaceous climbers, distinguished from IPOMÆA and ARGYREIA by the pollen grains smooth not spiny, and the two stigmas oblong not rounded. Fruit a capsule.

Convolvulus flavus *Willd.; F.B.I.* iv 219, IX 9. A climbing plant, rusty pubescent on the branches and young parts, with triangular-hastate or cordate leaves, deeply lobed and toothed, up to 3 by 1½ inches. Flowers ½ inch yellowish, funnel shaped.

West Ghauts: Nilgiris and Pulneys 3,000 to 6,000 feet [*G.F.M.P.*].

PORANA. F.B.I. 101 XI.

Large climbing shrubs characterized by the small white flowers in long racemes or panicles. Fruit a capsule with 1 seed only, enclosed in the enlarged papery sepals.

Porana paniculata *Roxb.*, a north Indian species, is the "Bridal of Madras gardens"; P. volubilis, a Malay species, is also cultivated.

Porana malabarica *C. B. Clarke; F.B.I.* iv 223, XI 7. A much branched climber with ovate cordate long pointed leaves.

West Ghauts from the Bababoodons to the Nilgiris, Anamalai Pulney and Travancore hills, up to 6,000 feet [*G.F.M.P.*].

SOLANACEÆ.

Herbs or shrubs with leaves alternate, or in the upper parts in unequal pairs, and solitary or cymosely arranged perfectly regular monopetalous flowers. Corolla often lobeless and plaited in bud. Stamens five attached to it. Ovary of two carpels, with numerous ovules on peltate

placentas. Fruit a many-seeded berry or capsule. Distinguished from other similar families by the partition wall (united placentas) of the ovary not reaching quite to the top, the seeds round and very thin (flat discs) and the anthers usually large and opening by terminal pores.

Species about 1,500 in the warmer parts of the whole world, but more especially South America.

The family is divided into four sub-orders, which differ chiefly in the fruit and the folding of the corolla. Common examples of these are—

I. *Petals folded or valvate, fruit a berry* SOLANUM Potato, Brinjal; LYCOPERSICUM Tomato; CAPSICUM Chili; PHYSALIS Cape Gooseberry.

II. *Petals imbricate, fruit a berry* LYCIUM a shrub of English gardens; ATROPA Belladonna.

III. *Petals folded or imbricate, fruit a capsule* DATURA Thorn-apple.

IV. *Petals folded and valvate, fruit a capsule* NICOTIANA Tobacco.

KEY TO THE GENERA.

a { Fruit a berry enclosed in a large inflated calyx . . . *b*
Fruit a berry, not enclosed; leaves simple; corolla flat . SOLANUM.
Fruit a prickly capsule; corolla funnel-shaped. DATURA.

b { Flowers blue, calyx five-partite (Wintercherry). NICANDRA.
Flowers white with purple spots, calyx only shortly lobed (Cape Gooseberry) . . . . PHYSALIS.

SOLANUM. F.B.I. 102 I.

Potato, Brinjal.

Herbs or climbing plants with the characteristics given above for the family, but the fruit a berry, the corolla with short tube and nearly flat (rotate) limb, folded in bud, anthers large on very short stalks, and opening by terminal pores.

Species perhaps 1,000 in tropical and sub-tropical regions and especially in America.

The ordinary (not the "Sweet") potato is a tuberous enlargement of an underground branch, its 'eyes' being undeveloped buds (from which the new shoots arise when a tuber or a portion of it is planted). It was introduced into Europe from South America. The Brinjal or Egg-plant is the fruit (berry) of S. melongena.

a
- Climbing plants with white flowers and pinnate leaves. . . . 1. S. Seaforthianum.
- Ditto but with simple leaves . . . 2. S. convolvulus.
- Unarmed plants . . . . b
- Stems and often leaves armed with prickles . . . . d

b
- Thin-stemmed shrubs. Flowers fascicled in leaf-axils . . 4. S. denticulatum and 3. S. læve.
- Flowers extra axillary . . . . . . 5. S. nigrum.
- Large shrubs or small trees (introduced plants) . . . c

c
- Flowers 2 inches blue or white . . 6. S. macrophyllum.
- Flowers $\frac{1}{2}$ inch two ear-like leaves at each leaf axil . . . 7. S. auriculatum.

d
- Flowers solitary or few, 2 inches, small shrubs . . . . 8. S. Wightii.
- Flowers in a double row, lateral : low shrubs . . . . e
- Flowers in terminal corymbs : large shrubs . . . . f

e
- Leaves ovate, lobed . . . . . . 9. S. indicum var.
- Leaves pinnatifid, very low shrub . 10. S. sisymbrifolium.

f
- Stem winged by decurrent petioles . 11. S. robustum.
- Leaves white underneath . . . . 12. S. giganteum.

* *Unarmed climbing plants.*

1. **Solanum Seaforthianum** *Dunal.* A climber. Leaves occasionally simple, more often deeply pinnately-lobed or compound. Glabrous except for a few hairs, and minute pubescence on the nerves ; terminal lobe largest, ovate or elliptic, acuminate. Flowers in terminal panicles white. Curt. Bot. Mag. t. 1982.

Common on trees, in stations of both plateaus.

Native of South America and introduced to England by Lord Seaforth in 1804 from the West Indies.

2. **Solanum convolvulus** *Sendt.* A climber like the last, but with simple ovate entire leaves, from 1½ to 2 inches by ½ to ¾ inch.

On trees, cultivated, Coonoor, Yercaud. Native of South Brazil.

** *Unarmed erect shrubs and trees.*

3. **Solanum læve** *Dunal.* ; *F.B.I.* iv 231, I 9. A small shrub with rather thin zigzag branches. Leaves broadly elliptic, acuminate at both ends, entire glabrous. Flowers fascicled in axillary pedicels, of ½ to 1 inch white. Sepals 5 linear. Corolla ¼ inch. Berry ⅓ inch red. **t. 355.**

Nilgiris : in light shade.

4. **Solanum denticulatum** *Blume, var.* **Gouakai** ; *F.B.I.* iv 232, I 10 *var.* Stem smooth or pubescent, without prickles, ⅙ inch thick. Leaf-stalk ½ to 1 inch ; blade 2 to 4 inches, ovate, acute or acuminate, narrowed to the stalk, with a few large coarse teeth in the further half, nearly or quite glabrous. Flowers several together in a leaf axil ; stalk ½ to ¾ inch. Sepals 7 or 8. Corolla ½ inch, white. Berry ⅓ inch, red, glabrous. Wight Ic. t. 1397.

In shady places. Pulneys in woods below Kodaikanal at 6,500 feet and below (Glen Falls), flowering June. Rare at the higher levels. Nilgiris : Kotagiri.

Gen. Dist. South India and Ceylon.

The species was founded by Blume on the Java plant, which has entire leaves, more than twice as long as broad. Our plant was originally described as a distinct species—S. Gouakai, by Dunal.

5. **Solanum nigrum** *L.* ; *F.B.I.* iv 229, I 1. A small shrub with smooth nearly glabrous branches. Leaves ovate-deltoid, 2 by ¼ inch often slightly lobed at the broadest part. Stem sparingly pubescent. Peduncles outside the leaf-axils, about ½ inch ; pedicles ¼ inch. Corolla white. Berry globose ¼ inch, red, black or yellow.

Nilgiris: Ootacamund roadsides, etc. Pulneys: above Pallangi and Vilpatti, etc.

Gen. Dist. India up to 7,000 feet and throughout tropical and temperate countries (England, etc.).

6. **Solanum macrophyllum** *Hort. ex Dun.* A tree with large lobed leaves, covered with stiff simple hairs on the upper side, and with stellate hairs on the lower; and bunches of large light and dark blue flowers. Curt. Bot. Mag. t. 4138.

Occurs occasionally in gardens. A native of Brazil.

This plant was called S. macranthum in my Fl. N. & P. Ht.

7. **Solanum auriculatum** *Ait.* A shrub of 10 to 15 feet characterized by the almost invariable presence in the axils of a pair of ear-shaped small reflexed leaves simulating stipules. All green parts covered with a tomentum of stellate hairs. Leaves, 8 to 14 inches by 3 to 5 inches, ovate, lanceolate, long-acute. Flowers in dense cymose corymbs. Corolla, $\frac{1}{3}$ to $\frac{1}{2}$ inch across, lilac or blue, glabrous inside, tomentose outside. Berry $\frac{1}{2}$ inch diameter, pubescent, yellow. **t. 356.**

Nilgiris: Coonoor along the stream which flows through Brooklands estate, etc., abundant there. Introduced from America.

*** *Prickly shrubs and herbs.*

8. **Solanum Wightii** *Nees; F.B.I.* iv 234, I 18. A small plant, almost a herb, distinguished at once among our species by the very large flowers. Prickles few and small. All green parts clothed with rather long hairs, and the undersides of the leaves with a very close tomentum as well. Leaves ovate, lobed, $1\frac{1}{2}$ to 3 inches. Flowers few or solitary, 2 inches across. Lavender blue. **t. 357.**

Coonoor: Lamb's Rock Road but not common. Flowers June.

This plant was named S. macranthum *Dun.* in the F. N. & P. Ht.

9. **Solanum indicum** *Linn.*, *var.* **multiflora** *Wight F.B.I.* iv 235, I 20 *var.* A low bush; stem much branched, stout, and covered with stellate, woolly, tomentum, armed, as also the leaves on the veins and inflorescence, with stout, flat (compressed), thorns, up to $\frac{1}{2}$ inch high, and $\frac{1}{5}$ by $\frac{1}{8}$ inch, broad at the base. Leaves 3 inches, ovate lobed; densely tomentose underneath, thinly so above. Flowers in raceme-like double rows on short stout peduncles. Pedicel $\frac{1}{10}$ inch, thick, spiny; in fruit $\frac{1}{3}$ inch. Sepals $\frac{1}{10}$ inch, tomentose, triangular. Petals $\frac{1}{5}$ inch, ovate acute, tomentose and pilose on the backs smooth inside, violet. Anthers not as long. Style slightly longer, stellately hairy, except at the end. Fruits crowded, the pedicels decurved so that all face downwards, changing from a rich orange to dark purple, $\frac{1}{4}$ inch diameter. Seeds $\frac{1}{6}$ by $\frac{1}{8}$ inch flat, covered thickly by very small warts. **t. 358.** Wight Ic. t. 1400 (S. ferox-minus).

In the open. Nilgiris: on the Ootacamund downs common, especially towards Pykara and below. Pulneys: down to 5,500 feet.

10. **Solanum sisymbriifolium** *Lamk.* A low shrub covered rather with glandular hairs and also sharp yellowish prickles. Leaves deeply pinnatifid, covered on both sides with stellate hairs, shorter and closer on the under. Flowers in terminal corymbs white or lilac. Berries orange-red 1 inch diameter glabrous and glossy, not or hardly overtopped by the calyx lobes. **t. 359.** Curtis. Bot. Mag. tt. 2568, 2828.

Nilgiris: Coonoor abundant, Kotagiri, etc. A native of Brazil.

11. **Solanum robustum** *Wendt.* A shrub of 4 to 6 feet, distinguished among our species of the genus by the margins of the leaves being decurrent as wings 2 to 3 inches down the branches. Densely tomentose all over, especially on the young parts and peduncles with reddish brown branched hairs. Prickles on the stem compressed glossy and curved, like those of a rose, on the leaves narrow and straight. Leaves in general outline ovate, with shallow triangular lobes. Peduncle 1 to 2 inch, outside the axils. Flowers white, $\frac{3}{4}$ inch, the corolla divided nearly to the base into narrow $\frac{1}{2}$ inch lobes. Berry 1 inch in diameter, globose-acute, tomentose, green. **t. 360.**

Nilgiris : Coonoor abundant. A native of South America.

12. **Solanum giganteum** *Jacq. ; F.B.I.* iv 237, I 14. A large shrub, almost a tree, with the branches and undersurface of leaves, very white and armed with a short conical prickles on the branches. Leaves 6 to 8 inches by $1\frac{1}{2}$ to $3\frac{1}{2}$, elliptic ; when young with a few scattered stellate hairs on the upper side but soon glabrous, densely white tomentose on the lower side. Flowers in terminal or lateral very dense flat corymbs ; calyx white, corolla lilac, small. Berries $\frac{1}{4}$ to $\frac{1}{3}$ inch, glabrous, red.

Nilgiris : by sholas on the edges of the plateau, Kotagiri, Kodanad, Coonoor, Naduvattam, etc.

Gen. Dist. South India and Ceylon, 3,000 to 7,000 feet.

CYPHOMANDRA.

Cyphomandra betacea *Sendt* ; Tree Tomato. A shrub or small tree with dark velvety leaves, smelling strongly of mice. Flowers white. Fruit egg-shaped, smooth. Curt. Bot. Mag. t. 7682.

Nilgiris : Coonoor.

A native of New Grenada, introduced first into England in 1803.

PHYSALIS. F.B.I. 102 II.

Herbs with solitary axillary flowers of the SOLANUM type, but anthers opening by longitudinal slits (not pores) and berry enclosed in a thin papery bag (the enlarged calyx).

Species perhaps 30, natives chiefly of America and more especially Mexico and North America ; but a few widely distributed over the warmer parts of the world.

Physalis peruviana *Linn.* ; *F.B.I.* iv 238, II 2 ; Cape Gooseberry. Leaf-stalk 1 inch ; blade ovate-cordate, 2½ by 2 inches. Flower-stalk ½ inch. Corolla white with purplish spots. Calyx in fruit 1½ inches long. **t. 361.**

Cultivated and now in places run wild. A native of South America, from which it was introduced into England in 1772.

NICANDRA. F.B.I. 102 iii.*

Species one only, native of Peru. Named after Nicander of Coloption who lived in the second century.

Nicandra physaloides *Gærtn.* ; *F.B.I.* iv 240, III * 1 ; Winter-cherry. Weak-stemmed and often climbing. Leaves irregularly toothed, glabrous. Flowers small, blue. Fruit surrounded by five much enlarged strongly veined sepals, free nearly to the base and cordate. **t. 362.**

Not wild but occasionally found as an escape.

DATURA. F.B.I. 102 VII.

Thorn-apple.

Species about ten in temperate and tropical regions.

Datura arborea *Linn* ; VII 4. A shrub growing to 10 or 15 feet, with elliptical oblong, entire, glabrous leaves and large bell-shaped flowers 8 by 6 inches, white

with strong sickly odour at night, folded inwards along five lines in bud. **t. 363.** In my Fl. N. & P. Ht. this was named D. Suaveolens.

A native of South America.

Datura stramonium *Linn.* ; *F.B.I.* iv 242, VII 1. A small shrub, branching often cymosely, a flower terminating the main stem. Leaves lobed. Flowers erect, usually white. Fruit very spiny, opening in 4 valves.

Native of the Himalayas.

SCROPHULARIACEÆ.

Herbs or shrubs with the lower leaves at least usually opposite. Flowers monopetalous, and more or less irregular, often two-lipped. Stamens four with sometimes a rudimentary fifth, or two only. Ovary superior of two cells, fruit a many-seeded capsule.

Species about 2,000 found all over the world.

This large family is divided into a number of tribes collected into three series—

Series A.—Leaves all alternate : corolla with two upper lobes outside the others in bud, e.g., VERBASCUM Mullein, CELSIA.

Series B.—Leaves at least the lower opposite : corolla with two upper lobes (or lip) outside in bud, e.g., LINARIA Toadflax, ANTIRRHINUM Snapdragon, MIMULUS Monkey-flower, ILYSANTHES.

Series C.—Corolla with the lower or a lateral lobe outside in bud, e.g., VERONICA Speedwell, SCOPARIA, STRIGA, SOPUBIA, EUPHRASIA Eye-bright, BARTSIA, PEDICULARIS Red Rattle, LATHRÆA.

KEY TO THE GENERA.

a { Leaves all alternate . . . . *b*
Lower leaves, or all, opposite . . . . *c*

b { Tall woolly herbs with spike of yellow flat flowers . . . *p.* 425. VERBASCUM.
Tall herb with pink or white pendant flowers . . . . *p.* 429. DIGITALIS.
Small herb with two-lipped yellow flowers . *p.* 431. STRIGA.

c
- Stamens 4 perfect . . . . d
- Stamens 2 and 2 yellow staminodes lying on the lower lip . *p.* 428. ILYSANTHES.
- Stamens 2 only spreading . . . . g

d
- Corolla distinctly 2-lipped . . . . . MAZUS and e
- Corolla flat or tubular the lobes sub-equal . . . . . f

e
- Upper lip flat, notched . LINDENBERGIA AND VANDELLIA.
- Upper lip compressed laterally . *p.* 433. PEDICULARIS.

f
- Leaves narrow, anthers with one spine-like sterile half . . *p.* 432. SOPUBIA.
- Leaves ovate, calyx winged. Flower blue. *p.* 427. TORENIA.
- Leaves ovate, calyx not winged . *p.* 427. LIMNOPHILA.

g
- Flower flat blue. Leaves simple upper alternate . . *p.* 430. VERONICA.
- Flower 2-lipped yellow. Leaves pinnate *p.* 425. CALCEOLARIA.

VERBASCUM. F.B.I. 103 II.

Usually very woolly tall herbs. Leaves alternate. Flowers yellow in simple or branched spikes. Corolla flat, upper lobes outside in bud.

Species about 160, in Europe, Western and Central Asia and North Africa.

Verbascum thapsus *Linn.*, Great Moth Mullein, *F.B.I.* iv 250, II 1. A stout erect herb, 2 to 4 feet high. Leaves oblong narrowed at the base and decurrent as two wings down the stem. Flowers yellow, in dense woolly spikes. Stamens 5, three yellowish woolly with short one-celled anthers, two larger glabrous and with larger anthers. Capsule globose. **t. 364.**

A weed of waste places and gardens, and also in old clearings. On both Nilgiri and Pulney plateaus.

Gen. Dist. From Great Britain across Europe and temperate Asia to the Himalaya. Naturalized also in America.

CALCEOLARIA. 103 III.*

Garden plants distinguished from all our genera by the corolla having a short tube and two bag-shaped lips with closed mouth. Stamens 2. Capsule conical septicidal.

Species 120; natives of western America especially of the Andes from Magellan to Columbia and Mexico, but with two in New Zealand.

Calceolaria mexicana *Bentham;* III* 1; common Slipper Flower.

Flowers lemon-yellow. **t. 365.**

On moist shady banks and by the edges of sholas; common in and near the hill-stations.

A native of Mexico, Gavatemala and Costa Rica.

MAZUS. F.B.I. 103 XII.

Small herbs with lower leaves opposite or in a rosette, upper sometimes alternate, and small flowers in terminal racemes. Calyx five-fid. Corolla tube short, upper lobe erect two-fid, lower much larger spreading, three-fid, throat with two-lobed plate. Stamens 4. Stigma of two flat lobes. Capsule small. Seeds numerous.

Mazus rugosus *Lour.; F.B.I.* iv 259, XII 1. An annual herb. Rosette leaves obovate-spathulate, 1 to 3 inches long, irregularly and coarsely serrate-toothed. Flowering stems numerous, 2 to 10 inches. Racemes 1 to 6 inches. Corolla $\frac{1}{2}$ to $\frac{3}{4}$ inch pale blue or white streaked with blue. Lady Bourne's Ootacamund flowers. **t. 93**

Nilgiris at Pykara (*Bourne*).

LINDENBERGIA. F.B.I. 103 XIV.

Flowers tubular and two-lipped, the upper two-lobed flat anderect; the lower spreading three lobed with two folds across. Stamens 4, the anther lobes separate distinctly stalked. Calyx campanulate. Capsule loculicidal with many seeds.

Species few only, in Africa, India and the Malay.

Lindenbergia urticæfolia *Link & Otto ; F.B.I.* iv 262, XIV 8. A very slender glandular herb. Leaves thin, ovate, cuneate at the base, coarsely serrate up to $1\frac{1}{2}$ by $\frac{3}{4}$ inch. Flowers about $\frac{1}{2}$ inch, capsule acute, short.

Shevaroys on walls and banks (*Wight—G.F.M.P.*).

LIMNOPHILA. F.B.I. 103 XVII.

Small herbs of marshy places, with aromatic oil in transparent dots. Leaves opposite or whorled, the lower in some species if in water deeply cut. Calyx of 5 narrow sepals. Corolla tube cylindrical, the upper lobes outside in bud. Stamens 4 all perfect ; anther cells separate. Capsule ovoid or oblong. Seeds numerous.

Species about 30, in Africa, Asia and Australia.

Limnophila hypericifolia *Benth. ; F.B.I.* iv 269, XVII 14. An erect herb with stout unbranched stem of 1 to 2 feet. Leaves half-stem-clasping all oblong or ovate, minutely toothed round the obtuse apex. Flowers sessile in the upper axils, $\frac{1}{2}$ to $\frac{3}{4}$ inch, long, erect, tubular, mauve coloured. **t. 366.**

In marshy places and streams. Nilgiris : on the downs and to Coonoor, etc.

TORENIA. F.B.I. 103 XXIII.

Weak glabrous herbs with four-angled stems, opposite leaves and terminal or axillary solitary or umbelled flowers ; characterized chiefly by the calyx being winged, and by the upper stamens being very short, the lower longer and with an appendage on each filament. The four anthers converge in pairs at the back of the corolla. Corolla a wide bell-shape, with four lobes, the upper

notched. Capsule linear or oblong, separating septicidally from the seed-bearing axis. Seeds numerous rough.

Species about 30, in the tropics of Asia and Africa.

Torenia asiatica *Linn.*; *F.B.I.* iv 277, XXIII 5. Leaves shortly petioled, ovate, serrate. Pedicels axillary, thicker in fruit. Corolla 1¼ inches, blue with dark violet lateral lobes. **t. 367.** Wight Ic. t. 862.

Nilgiris: Coonoor in damp shady places on Lamb's Rock Road, etc.

Gen. Dist. Mountains of South India and to Japan. Varieties of this are commonly grown in Madras gardens.

VANDELLIA. 103 XXIV.

Flowers with 5 equal sepals two-lipped corolla (upper lip notched, lower of 3 spreading lobes) and 4 perfect stamens, with distinct and divergent anther lobes, thetwo upper stamens attached to the throat of the corolla, the two lower with arched filaments attached to the throat and conniving under the upper lip, and with an appendage near the base.

Species about 30 in the warmer parts of the world.

Vandellia sessiliflora *Benth.*; *F.B.I.* iv 282, XXIV 11. An erect glabrous much-branched low herb with rounded crenate-serrate leaves ¾ to 1 inch diameter close clusters of sessile flowers, often deistogamic, and ellipsoid capsule.

Nilgiris, Pulney Hills and Annamallai Hills, 2,000 to 6,000 feet [*G.F.M.P.*].

ILYSANTHES. F.B.I. 103 XXV.

Annual glabrous herbs with opposite leaves, characterized by the solitary axillary flowers, which are slightly two-lipped, and have lying on the lower lip two yellow

staminodes, and by the long narrow capsule. Upper stamens 2, perfect, stigma of 2 lamellæ. Seeds many, rough. The genus includes part of the old genus BONNAYA.

Species few in tropical Asia and Africa.

Ilysanthes veronicæfolia *Urban*, formerly Bonnaya ver. *F.B.I.* iv 285, XXVI 3. Stem weak often rooting at the lower nodes. Leaves oblanceolate-oblong or elliptic, $\frac{3}{4}$ to $1\frac{1}{2}$ inch by $\frac{1}{8}$ to $\frac{1}{3}$ inches entire or with distant serrations. Flowers in terminal racemes $\frac{1}{2}$ inch purplish, erect. Pods $\frac{1}{2}$ to $\frac{3}{4}$ inch by 1 inch. **t. 368.**

On both plateaus at 6,500 feet: Kotagiri, Coonoor, Vilpatti and below.

Ilysanthes hyssopioides *Benth.*; *F.B.I.* iv 283, XXV 1. A marsh plant. Stem 6 to 10 inches, weak. Leaves $\frac{3}{4}$ by $\frac{1}{8}$ inch, one or three nerved, entire. Flower-stalks in the upper axils, $\frac{3}{4}$ to 1 inch, very slender. Sepals $\frac{1}{6}$ inch. Corolla $\frac{1}{2}$ inch, pale blue. Capsule hardly longer than the sepals, obovoid. **t. 369.**

Nilgiris: Pykara in wet places.

Gen. Dist. Deccan, Ceylon, lower hills of India, China.

DIGITALIS. 103 XXXIV.

Foxglove.

Species about 18 in Europe and western and middle Asia.

Digitalis purpurea *Linn.*; XXXIV * 1; common Foxglove. Flowers in a tall handsome spike. Corolla 2 to $2\frac{1}{2}$ inches tubular, broadening towards the mouth, pink with dark purple spots, hanging with mouth downwards. Stamens four, anthers cohering under the upper side of the corolla. Fruit a capsule, $\frac{5}{8}$ inch, pubescent with jointed glandular hairs, splitting open by an upper and a lower

valve. Seeds numerous, reddish brown. Leaves mostly at the base; elliptic ovate, narrowed up to 12 by 6 inches only.

In woods near Ootacamund as a garden-escape. Kodaikanal, common.

A common European plant. *Fr.* Digitate rougeatre. *Ger.* Rothe Fingerhut. Malformations by which two or three flowers at the summit coalesce into one widely open corolla at the top while others lower down on the spike are undeveloped, occasionally occur.

VERONICA. F.B. I. 103 XXXIX.

Herbs, shrubs or rarely trees with opposite or alternate leaves and flowers in bracteate racemes (or occasionally solitary); distinguished by the corolla tube very short and lobes flat, a lateral one exterior in bud, the stamens two only, and the fruit a two-valved capsule often notched at the top.

Species 200, in temperate and cold regions of the whole world, widely dispersed.

Stems prostrate: leaves alternate: flowers pedicelled in the leaf axils . . . Common Speedwell . . . . V. agrestis.
Stem erect: leaves opposite: flowers in axillary bracteate spikes . . . . V. javanica.

Veronica agrestis *Linn.*; *F.B.I.* iv 294, XXXIX 9. A tender prostrate plant; pubescent with jointed hairs, some glandular. Leaves $\frac{1}{2}$ to $\frac{3}{4}$ inch, shortly stalked, ovate, abrupt or cordate at the base, coarsely serrate. Pedicels axillary $\frac{1}{2}$ to 1 inch, very slender. Sepals ovate-elliptic, $\frac{1}{8}$ inch, fringed with simple and a few glandular hairs. Corolla blue. Fruit of two divergent lobes, one net-veined when ripe and slightly keeled. **t. 370.**

Roadsides. Ootacamund: Lovedale. There appears to me to be no difference between this and the European plant, the common or Corn Speedwell.

Gen. Dist. Of species and varieties—widely, all over Europe and northern Asia to Japan, Himalayas, etc. *Fr.* Velvate sauvage, *Ger.* Ackerohrenpresis.

Veronica javanica *Bl.* ; *F.B.I.* iv 296, XXXIX 15 ; Java Speedwell. Tender, annual herb. Stems numerous erect. Leaves opposite, shortly stalked, $\frac{3}{4}$ to $1\frac{1}{4}$ by $\frac{1}{2}$ to $\frac{3}{4}$ inch, deltoid with abrupt nearly horizontal base, coarsely serrate, pubescent. Spikes of flowers axillary, 2 to 3 inches : bracts $\frac{1}{4}$ inch, oblanceolate : pedicel $\frac{1}{8}$ inch. Corolla $\frac{1}{4}$ inch, capsule $\frac{1}{2}$ to $\frac{1}{8}$ inch, not longer than the sepals. Style $\frac{1}{30}$ inch.

Nilgiris : Lovedale (collected by Miss Edwards in November). Pulneys : Kodaikanal (*Bourne*) and below.

Gen. Dist. Java, Himalayas, Loochoo islands. The first record of this species in South India was, I think, in my F. N. & P. Ht.

STRIGA. F.B.I. 103 XLII.

Small herbs with slender stem and narrow leaves, rough with hard short hairs, and drying black. Flowers in the axils of the upper leaves. Calyx tubular, more or less deeply divided into its five parts. Corolla with a slender tube bent about half-way, a large flat lower lip, and small upper one. Stamens four, not exserted ; anthers one-celled. Capsule opening in two valves which separate from the placentas. Seeds very numerous with rough coat.

Species about 20, in the better parts of the world.

Striga lutea *Lour.* ; *F.B.I.* iv 299, XLII 3. A small herb common in the grass of open downs with short, narrow leaves and sulphur yellow flowers.

Stem unbranched, 3 to 4 inches. Leaves sub-opposite, linear, $\frac{1}{2}$ to $\frac{3}{4}$ inch, erect and usually curved towards the axis. Calyx ten-ribbed with hairs on bulbous bases.

Corolla tube exserted $\frac{1}{6}$ inch above the calyx, contracted and abruptly incurved just below the limb : upper lobe outside in bud. Capsule sessile, not as long as the calyx, brown, opening by two valves. **t. 371.**

A parasite by its roots on roots of small herbs. Very common on the open downs and at lower levels.

Gen. Dist. All over south and western India, mainland of south-east Asia and tropical and South Africa, Madagascar.

SOPUBIA. F.B.I. 103 XLV.

Herbs with opposite narrow or deeply divided leaves and flowers with one of the lower lobes exterior in bud ; stamens 4 ; anther cells unequal, one stipitate and empty ; stigma thickened ; seeds with lax skin.

Species under 10, natives of South Africa, India, Malaya, and Australia.

Corolla longer than broad, pink . . . . . . S. delphinifolia.
Corolla broader than deep, yellow . . . . . . S. trifida.

Sopubia delphinifolia *G. Don. ; F.B.I.* iv 302, XLV 1. An erect herb up to 3 feet. Upper leaves simple, $\frac{1}{2}$ inch ; lower with rachis of $1\frac{1}{2}$ to 2 inches and two or three pairs of hardly broader, filiform, segments. Flowers axillary, stalks $\frac{1}{6}$ inch. Calyx tube $\frac{1}{8}$ to $\frac{1}{4}$ inch : teeth $\frac{1}{4}$ inch acute. Corolla pink, tubular, narrow below, inflated above ; lobes $\frac{1}{8}$ inch, rounded, imbricate. Stamens four, the middle and upper pair longer. Anther lobes attached at their summits to the filaments, free below. Capsule oblong, seeds oblong rounded at both ends, striated. **t. 372.**

In the open, among grass, a root parasite.

Pulneys : on the downs high above Kodaikanal. Nilgiris : near Ootacamund, etc.

Gen. Dist. Mysore, Carnatic, Travancore, Kanara and, generally, uplands of South India, Bundelkund Behar, Ceylon.

Sopubia trifida *Ham.* ; *F.B.I.* iv 302, XLV 2. An erect herb. Upper leaves $\frac{1}{2}$ to $\frac{3}{4}$ inch, simple ; lower 1 to $1\frac{1}{2}$ inches, with one pair of narrow but hardly filiform segments. Flowers one or more in a leaf-axil ; pedicels $\frac{1}{2}$ inch. Calyx $\frac{1}{5}$ inch ; lobes shorter than the tube, fringed with hairs. Corolla cup-shaped $\frac{3}{8}$ to $\frac{1}{2}$ inch, creamy-yellow, as broad or broader than deep and bowl-shaped. Capsule egg-shaped or ellipsoid, notched at the top. **t. 373.**

In the grass of the open hill-side, and in damp places. Pulneys : on the downs flowering from May. Nilgiris : Ootacamund to Avalanche and Naduvattam flowering from August.

Gen. Dist. Hills of South India, Ceylon, Siam, China, Philippines.

PEDICULARIS. F.B.I. LII.

Perennial herbs with lower leaves usually pinnately lobed or divided, and axillary two-lipped monopetalous flowers, characterized by the calyx being split down the middle of the upper and lower lip, and the upper lip of the corolla high and compressed and much narrower than the spreading lower, and inside it in bud. Stamens four, didynamous, with transverse anthers meeting under the upper lip. Capsule compressed ovate or lanceolate, often bent, opening loculicidally. Seeds numerous, of various shapes, with close or loose, smooth or wrinkled skin.

Species 250, in Europe, Asia, and both Americas. *Eng.* Lousewort, Red Rattle ; *Ger.* Sumpflaüsekraut. Allied to RHINANTHUS Yellow Rattle ; *Fr.* Cocote ; *Ger.* Klapper groote, Ratelaar.

Pedicularis zeylanica *Benth.* ; *F.B.I.* iv 317, LII 37 ; Pink Rattle. Stem $1\frac{1}{2}$ to 2 feet or branched and diffuse

green pubescent. Leaves 2 by $\frac{1}{2}$ to $\frac{1}{3}$ inch, or even only 1 by $\frac{1}{6}$ inch, oblanceolate-oblong, cut about half-way to the midrib into narrow rounded lobes, which are again lobed, and often also curled downwards. Flowers in the upper axils : pedicels $\frac{1}{8}$ inch, calyx tube $\frac{1}{3}$ inch, villous, cylindrical with oblique mouth. Corolla pink, exserted well beyond the calyx. Anther lobes with acute bases. Capsule $\frac{1}{4}$ inch. **t. 374.** Wight Ic. t. 1419.

Common in damp places in the open. Pulneys : on the downs below and above Kodaikanal ; flowering May to September. Nilgiris : near Ootacamund to Kotagiri.

Gen. Dist. Mysore and hills of South India and Ceylon.

Except for being erect and taller, this is very like P. sylvatica of Europe. *Eng.* Procumbent Lousewort.

Pedicularis perrottetii *Benth. ; F.B.I.* iv 317, LII 36. Remarkable for the very large white flowers, between 3 to 4 inches long : occurs at Avalanche but not, I think, on the higher levels. **t. 375.** Wight Ic. t. 1418.

OROBANCHACEÆ.

Herbs of a brown, purplish, or white colour, never green, parasitic on the roots of other plants. Stem simple, erect, bearing scales instead of leaves, and a terminal spike of flowers each in the axil of a scale. Flowers much as in the SCROPHULARIACEÆ, but the ovary though of two carpels without partition. Seeds numerous.

Twelve genera with about 130 species.

In England species of OROBANCHE (Broomrape), and LATHRÆA (Toothwort) occur.

CHRISTISONIA.

Fleshy herbs, as described above. Calyx tubular. Corolla not two-lipped, the lobes equal broad and spreading. Anthers cells unequal, one-spurred and empty.

Christisonia Saulierei *Dunn.*; *G.F.M.P.*, *p.* 976; *F.B.I.* II i.* Stem tall quite glabrous, 4 to 12 inches. Scales ½ inch oblong. No bracteoles. Calyx tube ½ to ¾ inch. Corolla small to 1½ inches by ¾ inch at mouth; lobes obtuse erect. **t. 376.**

Pulneys: Kodaikanal and above, parasitic on Strobilanthes.

This plant was included in my F. N. P. Ht. in C. tubulosa *Benth.*

Christisonia tubulosa *Hook. f.*; *F. B.*. iv *I*, 321, II 1. Similar to C. Saulierei but flowers much larger. Corolla tube 2½ inches, reddish, 1½ inches. across the lobes. Lobes dark red, spreading, rounded. Basal scales red, and plant yellow with heddish streaks.

Pulneys: about Shembaganur.

Gen. Dist.: Western Ghauts at lower levels.

Christisonia bicolor *Gardn.*; *F.B.I.* iv 322, II 6. Stem glandular hairy, short, bracteoles 2. Flowers 2 to 2½ inches long close together in more or less of a corymb, pale rose or yellow colour and white.

Nilgiris: at 5,500 feet and above, Naduvattam, below Coonoor, etc.

CAMBELLIA.

Similar to Christisonia but anthers one-celled, opening by a pore at the apex. Stem short. Flowers in dense heads.

Campbellia cytinoides *Wt.*, *Ic. t.* 1425; *F.B.I.* as Christisonia neilgherica iv. 322. Flowers yellow. **t. 377.**

Pulney: downs; flower June (*Bourne*). Nilgiris at Pykara, Naduvattam, etc., parasitic on Strobilanthes.

LENTIBULARIACEÆ.

Principal Genus **UTRICULARIA.** F.B.I. 105 I.

Bladderwort.

Small herbs, growing in damp places or in water, and many remarkable for having, on the much dissected submerged leaves, small bladders which trap and ultimately digest and absorb small animals. Flower-stem erect, slender, leafless. Calyx two-partite. Corolla of two lips, upper entire or emarginate, lower larger three to six lobed, with a pointed, curved or straight, spur below. Stamens two, with broad filaments. Style short, stigma of two unequal lobes. Fruit a one-celled globose capsule, with many seeds on a basal placenta.

A genus of some 150 species scattered over the whole world and in all climates; in India from the plains of Madras to the top of the Nilgiris, and at least 1,000 feet on the Himalayas of Sikkim.

The species were very difficult to distinguish but have been revised and their arrangement much simplified in the '(Flora of the Madras Presidency)' from which (as elsewhere in this book) the names here given are taken.

KEY TO THE SPECIES.

a { Leaves linear . . . . *b*
Leaves round, $\frac{1}{10}$ inch. Flower white with lilac margin .
7. U. striatula.

b { Bracts attached at the middle . . . . *d*
Bracts attached by their bases : flr. blue or purple . . *c*

c { Flower yellow : stems twining . . . 4. U. Wallichiana.
Flower blue or purple : stem erect . . . .
1. U. graminifolia and 2. U. uliginosa . *d*

d { Flower blue or purple : stem twining . 3. U. Smithiana.
Spur longer than the lower lip . . . . 6. U. cærulea.
Spur short . . . . 5. U. rosa-purpurea.

1. **Utricularia graminifolia** *Vahl; F.B.I.* v. cærulea, iv 331, 105, I 9; Common Blue Bladderwort. Flowering stem to 6 inches, with a few scales attached by the bases. Leaves linear evanescent. Flowers few, sub-terminal. Pedicel $\frac{1}{5}$ inch, pinkish purple. Calyx lobes ovate, acuminate. Upper lip of corolla obovate, $\frac{1}{6}$ by $\frac{1}{5}$ inch, finely veined, blue, erect; lower lip much arched in the middle, blue at the sides, lighter but with purple veins in the centre: spur $\frac{1}{4}$ inch, slender, pointing nearly vertically downwards. Bladders on the submerged leaves $\frac{1}{30}$ inch, dark purple. Seeds reticulate with elongate areoles. **t. 378-A.** Wight Ic. tt. 1573, 1578 (2), 1575.

Nilgiri and Pulney: common in marshy places; flowering May.

2. **Utricularia uliginosa** *Vahl.; F.B.I.* (U. affinis) iv 330, 18. A smaller plant than the last, and the areoles on the seeds hexagonal, scrobiculate. Flowers bluish purple. Wt. Ic. 1580. Fig. 1; 1578, fig. 1.

Western Ghauts. Nilgiris to 7,000 feet [*G.F.M.P.*].

3. **Utricularia Smithiana** *Wt. Ic. t.* 1577; *F.B.I.* (U. cærulea *var.*) iv 331, I 900.** Similar to U. graminifolia, but larger, twining. Flowers blue, mauve and lilac. Seeds globose, with irregular reticulation.

Pulneys: near Kodaikanal [*Bourne—G.F.M.P.*].

4. **Utricularia Wallichiana** *Wight; F.B.I.* iv 332, I 14; Yellow Bladderwort. Flowering stem 1 to 1$\frac{1}{2}$ inches, very slender, with a few small bracts attached by their bases, but no leaves at the flowering time. Pedicels $\frac{1}{8}$ inch, erect. Calyx lips acute; upper $\frac{1}{8}$ inch; lower $\frac{1}{10}$ inch. Corolla yellow; upper lip acute $\frac{1}{8}$ inch;

lower notched at the end, corrugated, with a high arch in the middle and decurved sides. Fruit enclosed in the two, now nearly circular, calyx lips, $\frac{1}{12}$ inch, flat with very thin walls. Seeds small sand-coloured, longitudinally wrinkled in irregular folds **t. 378-B**. Wight. Ic. t. 1572, fig. 1.

Marshy places in the open. Nilgiris : near Pykara on the river bank ; Kaity. Pulneys : Kodaikanal down to Machur.

Gen. Dist. South Indian hills and Ceylon.

5. **Utricularea rosa-purpurea** *Staff.*, " Spur shorter than the lower lip of the corolla, obtuse straight : the upper lip obovate, the lower $\frac{1}{3}$ inch long, slightly more broad, the sides reflxed ". Flowers dark purple or pinkish, rather large. Leaves rather short and spathulate. [G.F.M.P.] **t. 378-C.**

Pulneys : 7,000 feet. Also Anamalais and Travancore hills.

I cannot be certain that the figure is of this species as I have not seen Staff's plant.

6. **U. cærulea** *Linn. ; F.B.I.* (U. racemosa) iv 333, I 17. Stems tall, sometimes branched. Bracts attached by the middle. Flowers nearly sessile, rather crowded, white to purple. Spur longer than the lower lip, horizontal. Capsule orbicular, on a short deflexed pedicel. Leaves spathulate. Wt. Ic. 1583, 1582.

Western Ghauts. Pulneys, Shevaroys [*G.F.M.P.*].

7. **Utricularia striatula** *Sm.; F.B.I.* (U. orbiculata) iv. 334, I 19. A very small plant with hair-like stem 2 to 3 inches high, distinguished among our species by the nearly circular leaves $\frac{1}{10}$ inch diameter on long stalks at the base. Upper lip of corolla white, the lower broad, five-lobed, white with yellow on the throat and

lilac margin. Small bladders may be found below the leaves. **t. 378-D.** Wt. Ic. t. 1581. (U. glochidiata.)

Nilgiris: Naduvattam, 6,000 feet. Flower September.

GESNERACEÆ.

Mostly herbs, though some shrubby, with opposite or alternate, often radical leaves. Calyx and corolla typically five-lobed, but stamens two or four only. Corolla mostly two-lipped with the upper lip, or two lobes, inside the others in bud. Ovary one-celled, remarkable for the two large placentas projecting into the cavity on thinner portions, which may divide the ovary incompletely into two cells. Seeds numerous.

Genera about 80, species 800 or 900 in south-east Asia, Polynesia, and tropical America.

In some of the family one only of the two seed-leaves (cotyledons) is developed, and it may increase in size continuously and be the only leaf the plant ever possesses.

KEY TO THE GENERA.

Climbers on trees. Flowers scarlet . . . ÆSCHYNANTHUS.
Ground herbs with radical leaves and leafless flower stalks . DIDYMOCARPUS.
Herb with leafy stem and bright blue flowers. . . KLUGIA.

ÆSCHYNANTHUS. F.B.I. 106 I.

Shrubby plants growing on the branches of trees. Leaves opposite, succulent or leathery. Flowers in small stalked bunches at the ends of the branches, with the characters of the family, but distinguished by having four perfect stamens projecting out of the flower, the seeds borne on the outer, not the ad-axial sides of the placentas, and the pod very long and slender.

Species over 50 in India and Malay region.

Æschynanthus Perrottetii *A.DC.* ; *F.B.I.* iv 339, I 8. Leaves 3 to 4 inches by $\frac{3}{4}$ to 1 inch, narrowed to each end, rather fleshy, stalk $\frac{1}{6}$ to $\frac{1}{4}$ inch. Flowers $1\frac{1}{2}$ inches, scarlet, nearly erect, with mouth sideways. Pod 5 inches by $\frac{1}{6}$ inch. **t. 379.**

Pulneys, near the above Kodaikanal in Gundattu and Gundan valley sholas. Nilgiris : near Pykara, Avalanche (abundant), flower September.

DIDYMOCARPUS. F.B.I. 106 IV.

Herbs with no leafy stem above ground, all the leaves radical. Flowers on a branched leafless stem. Corolla tube cylindrical, not two-lipped. Stamens two perfect, 2 or 3 imperfect. Capsule linear. Seeds ellipsoid smooth.

Species 80 from India through Malaya to China, Australia.

Didymocarpus tomentosa *Wt.* ; *Wall.* ; *F.B.I.* iv 353, IV 33. Leaves broadly elliptic, with short or no stalks, much wrinkled and with shallow crenations ; upper surface covered with short hairs, lower tomentose on the fine reticulations. Upper part of flowering stem glandular-pubescent. Flowers mauve-pink. Corolla tube $\frac{1}{3}$ inch, curved, limb spreading ; capsule $\frac{2}{3}$ inch. **t. 380.** Wt. Ic. t. 1349.

Nilgiris, Kotagiri, Biccapatti, Pulneys at 5,000 feet and above. Common on the Kodaikanal Ghaut path near Shembaganur.

The leaves are very like those of the English Primrose but hairy.

Didymocarpus Humboldtiana *Gardn.* ; *F.B.I.* iv 353, VI 35. Leaves ovate, obtuse 3 by 2 inches, the older petiole up to 2 inches ; when young tomentose. Scape 2 to 4 inches. Flowers lilac or pale purple, corolla campanulate, $\frac{3}{4}$ inch, wide at mouth. Pod 1 inch or more, slender. Govt. Bot. Mag. t. 4757.

Nilgiris : Coonoor. Pulneys : 6,000 feet (*Bourne*).

KLUGIA. F.B.I. 106 XV.

Species three in India and Ceylon, one or two in Mexico, all very similar in general appearance.

Klugia Notoniana *A.DC.*; *F.B.I.* iv 366, XV 1. A herbaceous plant of moist situations, with thick smooth stems, ear-shaped or begonia-like leaves and flowers with a very conspicuous deep blue lip hanging down.

Stem up to 3 feet, glabrous, translucent, swollen at the nodes. Roots fibrous. Leaves 4 to 8 inches by $2\frac{1}{2}$ to 5 inches, alternate, shortly stalked, very obliquely ovate, with sinuate or dentate margin, pubescent on both sides, soon withering: nerves numerous and very regular. Flowers in terminal racemes: pedicels $\frac{1}{6}$ to $\frac{1}{5}$ inch, horizontal in fruit. Calyx $\frac{1}{4}$ inch with five angles and teeth, winged at the uppermost, dorsal angle. Corolla tube $\frac{3}{4}$ inch and small upper lip white; lower $\frac{3}{4}$ to 1 by $\frac{3}{4}$ inch, deep rich blue, with yellow towards the mouth. Stamens four. Calyx in fruit pointing downwards. Capsule $\frac{1}{6}$ inch, spherical. Seeds very numerous on three sides of each of two large intruded placentas. Wight Ic. t. 1353. **t. 381**.

Pulneys: only in cool places near water, common at 5,500 feet, Silver Cascade, Shembaganur; but also (rare) on the downs above Kodaikanal. Nilgiris: Coonoor.

Gen. Dist. South India and Ceylon.

ACANTHACEÆ.

Shrubs and herbs characterized chiefly by the opposite leaves and swollen nodes, the flowers in spikes with conspicuous bracts and bracteoles, the stamens four only or two, and the fruit a capsule, from which when it opens the seeds are shot out by the elastic compressed stalks; but

there are exceptions to these characteristics. Leaves simple. Sepals usually distinct. Corolla two-lipped or nearly regular. Ovary superior with honey secreting gland round.

Genera about 140 and species 2,000 mostly in the tropics, but also in the Mediterranean region (whence the Acanthus motive of sculpture), Australia and U.S.A.

KEY TO THE GENERA.

a	Climbing plants. Flowers solitary with 2 large bracteoles (but no calyx) . . . . *p.* 442.	THUNBERGIA.
	Erect shrubs or weak herbs	
b	Corolla lobes nearly equal. Stamens 4 or 2	*c*
	Corolla strongly two-lipped. Stamens 2	*d*
c	Petals nearly separate. Sepals 4, 2 outer larger . . . . *p.* 453.	BARLERIA.
	Corolla bell or funnel shaped. Spike dense . . . . . *p.* 443.	STROBILANTHES.
	Corolla bell-shaped. Spike long, one-sided . . . . *p.* 454.	ASYSTASIA.
d	Stamens stiff, exserted . . . *p.* 454.	ANDROGRAPHIS.
	Stamens included. Spike one-sided. . *p.* 458.	RUNGIA.
	Stamens one-half anther lower and tailed . . . . *p.* 456.	JUSTICIA.

THUNBERGIA. F.B.I. 109. I.

Climbing plants with opposite leaves, and flowers pedicelled in the leaf-axils; distinguished from all others by the two large sepal-like bracteoles, the calyx reduced to a mere ring or a circle of small teeth, and the fruit depressed globose with stout beak (sterile part) above.

Species about 70 in the tropics of the old world.

T. grandiflora *Roxb.* with large blue flowers is common in Madras gardens. T. mysorensis has a yellow flower with brown centre.

Thunbergia tomentosa *Wall.* ; *F.B.I.* iv 391, I 2. Leaves ovate, lobed or not at the base. Bracts 1 inch. Calyx teeth very slender, up to $\frac{1}{4}$ inch long. Corolla pure white, tube $1\frac{1}{2}$ inches narrow, limb 2 inches across flat. Capsule with beak 1 to $1\frac{1}{2}$ inches, hairy. **t. 382.**

On the Ghauts up to 6,500 feet. Avalanche, Coonoor, Shevaroys ; common.

This species differs from T. fragrans of lower levels in its more slender sepals.

STROBILANTHES. F.B.I. 109 XVIII.

Large or small shrubs or herbs with opposite leaves and rather large violet or white, seldom yellow, flowers in heads or spikes. Corolla lobes in bud overlapping each other to the left. Stamens four (or two only fertile), of two lengths, filaments close together at the base. Ovary with two seeds in each cell (four in all).

Species 200, nearly all in Asia and especially on the Western Ghauts of South India.

Many of the species are *multiennials*, i.e., the plant flowers once only and then dies down ; and on these hills since nearly all the plants of a species flower as a rule in the same season, there is a great outburst of flower once in every few years. Between these years, it is often very difficult to find a single plant in flower.

The genus is remarkable for the variation in the pollen grains of different species and Clarke in Ms. at Kew has proposed dividing the Indian species among four genera as follows :—

ENDOPOGON *Nees* ; stamens two only, pollen grain ellipsoid with twelve to twenty ribs. Species of F.B.I. Nos. 6 and 12 to 20.

GUTZLAFFIA *Hance* ; stamens two only, pollen grains with tubercles or spines. Species of F.B.I. Nos. 5, 7, 9 to 11.

ACANTHOPALE *Clarke* ; stamens four, pollen grains with spines or prickles. Species of F.B.I. Nos. 22, 25, 28, 38, 43, 47, 60, 62 to 65, 76.

STROBILANTHES *Blume* ; stamens four, pollen grains ellipsoid with twelve to twenty longitudinal ribs. Sp. of F.B.I. 23, 24, 26, 27 and the remainder.

As many of the species flower only at long intervals and usually in the autumn months, there are several which I have not seen. Fortunately of most there are excellent illustrations published by Wight or Beddone and I have made full use of these in my description.

KEY TO THE SPECIES.

a Fertile stamens 2 with or without 2 sterile . . . . *b*
Fertile stamens 4 . . . . *c*

Stamens 2.

b Flrs. in head with 2 or 4 bract-like ls. below . . 1. S. foliosus.
Flowers in spikes . . . . *c*

c Spikes bracts ovate, dense, glabrous . 2. S. Kunthianus
Spikes very hairy, as also stem and leaves . . . . 5. S. gossypinus.
Spikes slender, bracts linear glandular . . . . . . *d*

d Spikes slightly glandular. Leaves long-acuminate . . 4. S. consanguineus.
Spikes in branched very glandular panicles. Leaves cuspidate white below . . . . 3. S. cuspidatus.

Stamens 4.

e Flower in heads . . . . *f*
Flower in spike . . . . *k*
Flower in axils of bracts, the pairs well separated . . . *m*

f Heads wedge-shaped, of pink imbricate bracts. Peduncle straight, often deflexed, covered like the branches with red hairs . . . . 7. S. Perrottetianus.
Heads flat or ovoid with 1 or 2 pairs leafy bracts . . . *g*

g Narrow basal part of corolla equal to the upper . . . *h*
Basal tube much shorter than the upper part . . . . *j*

h Corolla abruptly bent at junction of basal and upper part bent heads flat, woody inside . . 6. S. pulneyensis.
Corolla not abruptly bent though curved sideways.

i Bracts leafy, crenate in upper part : flower, blue . . . 8. S. papillosus.
Bracts narrow, hairy ; flowers white 9. S. neilghernensis

j Corolla straight, tube brown. Stamens all equal in mouth . . . . 10. S. Wightianus.
Stamens unequal. Leaves obovate . . 11. S. urceolaris.

k { Spikes terminal or axillary, bracts ovate acuminate hairy l
Spikes terminal or mostly so ; bracts acute, glabrous . m
Spikes erect from the old wood, bracts rounded. . . . 16. S. luridus.

l { Ls. sessile or nearly so, ovate very hairy . 12. S. sessilis.
Ls. stalked, acuminate : peduncles slender . 13. S. asper.

m { Spikes erect, bracts conspicuous, stamens 4 on lower side of curved corolla . . . . . 14. S. Zenkerianus.
Spikes deflexed ; bracts long ; stamens exsert . . . 15. S. micranthus.

n { Leaves oblong lanceolate, sessile or with auricled base decurrent on petiole, nodal-bracts ovate acute . . . 17. S. homotropus.
Leaves ovate, acute, abruptly rounded or decurrent on the long petiole, nodal-bracts oblong . 18. S. violacea.
Leaves elliptic decurrent not auricled up to 7 by 3 inches panicle very large and sticky, nodal-bracts small, linear . . . . 19. S. amabilis.

1. **Strobilanthes foliosus** *T. Anders.* ; *F.B.I.* iv 433, XVIII 12 ; ENDOPOGON. Stem and branches glabrous or glandular and strongly scented when old (like sandal-wood oil) angular. Leaves ovate-acuminate, narrowed to the stalk, $1\frac{1}{2}$ to 3 inches, finely serrate : nerves evenly spaced, arching forwards. Racemes very short and capitate : four outer bracts leafy. Corolla with a narrower portion $\frac{3}{4}$ inch, and an upper campanulate part 1 by $\frac{1}{2}$ inch, with rounded lobes. Stamens two. Pollen grains ellipsoid with about twenty longitudinal ribs. Seeds shining, drab-coloured like small pebbles. **t. 383.** Wight Sp. Nilg. 171 ; Ic. t. 1501.

Nilgiris and Pulney hills on the outskirts of woods 5,000 to 7,000 feet. Flowers frequently. Shembaganur, Coonoor.

2. **Strobilanthes Kunthianus** *T. Anders.* ; *F.B.I.* iv 434, XVIII 13 ; ENDOPOGON. The common Strobilanth of the open hill-sides. A gregarious shrub ; stem 2 feet,

reddish. Leaves 1½ by ¾ inch, with stalks of ½ inch rather hard, glabrous and green above, whitish below : nerves about eight pairs, broad. Spikes of flowers dense on short simple or branched axillary peduncles the bracts closely imbricated in four rows, ovate acuminate. Corolla about 1 by ½ inch, pale blue or mauve, inflated above, and with only a very short narrow part below. Stamens two. Pollen grains ellipsoid with ten to twenty longitudinal ribs and grooves. Capsule oblong : seeds four, densely hairy except on the circular basal areola on each of its faces. **t. 384.** *Wight Ic. t.* 448.

On the open hill-sides, covering large areas, on both plateaux, common.

Gen. Dist. Mountains of South India, Shevaroys, etc.

In t. 384 : *b.* ovary on disc ; *c.* stamen with part of corolla.

An occasional plant may be found in flower at all times, but at irregular intervals from 7 to 12 years the hill-sides are blue with the blossom. One such outburst of flower occurred in 1898 on the Pulneys. Another in 1910. On the Nilgiris full flowering occurred in 1887, 1899, 1910, 1916 On the Shevaroys in 1930. On Shevaroyan this species occurs in parts almost to the exclusion of every other plant.

3. **Strobilanthes cuspidatus** *T. Anders. ; F.B.I.* iv 435, XVIII 16 : ENDOPOGON. Distinguished among our Strobilanthes by the white underside of the leaves and the slender spikes with narrow sticky bracts and sepals. Shrub 2 to 5 feet : young parts, and nodes of older, sticky. Leaves long-stalked 1½ to 4 by 1 to 2½ inches, ovate, acuminate at both ends, glabrous above, white below ; nerves eight pairs very regularly spaced, veins indistinct ; stalk ¾ to 1½ inches. Spikes 1½ to 2½ inches by ⅓ inch, stalked in the leaf-axils, with often a pair of small leaves, ¼ to ½ inch long, about the middle of the stalk ; bracts elliptic long-acuminate ½ to ⅝ inch : bracteoles linear ½ to ⅝ inch. Sepals as long covered with long gland-tipped hairs. Narrow basal part of corolla ⅙ inch ;

broader part $\frac{3}{4}$ by $\frac{1}{3}$ inch ; limb slightly spreading of five rounded lobes. Stamens two. Pollen grains ellipsoid with about fourteen (twelve to twenty) longitudinal ribs and grooves. Capsule $\frac{1}{2}$ by $\frac{1}{6}$ inch shorter than the sepals. Seeds flat, apparently glabrous, but if wetted showing a dense fringe of circular hairs. **t. 385.**

Nilgiris : near Ootacamund, January 1911. March 1914 ; Coonoor 1919.

Earlier flowering dates appear to have been : 1838 (*Munro*), 1849 1851, 1870, 1884. In the Wynaad 1903.

In fig. 385 : *c* bract, inner surface glabrous ; outer with glandular hairs ; *d* ripe fruit ; *e* same opened ; *f* seed dry ; *g* seed in water showing spreading hairs.

4. **Strobilanthes consanguineus** *C. B. Clarke ; F.B.I.* iv 435, XVIII 17. A tall shrub straggling over and through others, similar to S. cuspidatus (t. 385) but the leaves not white underneath, the bracts and bracteoles shorter and less hairy, corolla mouth oblique. Flower blue or white.

Shevaroys : on Honey Rock, flower (white) January 1931. Other flowerings on the lower slopes of the Nilgiris and Pulney hills were in 1884, 1897, 1909, the period apparently 12 years.

5. **Strobilanthes gossypinus** *T. Anders. ; F.B.I.* iv 434, XVIII 14. A beautiful plant with all green parts covered with yellowish wool, as also the corolla in the dull gold woolly spikes. Leaves ovate $1\frac{1}{2}$ by 1 inch. Flowers pale blue. Flowered, 1867 to 1870, 1883, period 6 or 7 years.

On the extreme western edge of the plateau on the nearly vertical rocks overlooking Malabar and above Sispara.

Flowered 1867 to 1870, 1883, period 6 to 7 years.

6. **Strobilanthes pulneyensis** *Clarke ; F.B.I.* iv 438, XVIII 25. Hairy on all green parts. Leaves ovate,

acuminate, serrate, about 3 by 2 inches. Flowers in very flat densely white hairy heads, the rounded bracts forming rosettes. Corolla bluish $1\frac{1}{2}$ inches, basal tube as long as the ventricose part, bent at the junction to face sideways, ovary hairy at tip. Flowering December—January. **t. 386**.

Pulneys: 5,000 feet. Tiger shola, Shembaganur valley 1897, 1910. Kodai downs. October 1917. Shevaroys, flower September 1904.

7. **Strobilanthes Perrottetianus** *Nees ; F.B.I.* iv 439, XVIII 27. Distinguished in flower by the wedge-shaped, deflexed heads of pink imbricating bracts and conspicuous red hairs on all young parts and the leaves. Leaves ovate, acute or shortly acuminate, when dry lineolate by the minute linear crystals below the surface. Corolla 1 inch pale lilac, the narrow lower part entirely enclosed in the bracts. Filaments hairy, ovary glabrous **t. 387**.

Nilgiris: at Pykara, in flower September 1908. Doddabetta, September 1931. Pulneys on the upper downs, Marian shola, in flower June 1918. Earlier flowerings 1852, 1883—86, 1908.

8. **Strobilanthes papillosus** *T. And. ; F.B.I.* iv 445, XVIII 46. Heads erect with a pair of leafy involucral bracts, floral bracts 1 inch crenate in upper half. Bracteoles and sepals linear. Corolla blue with $\frac{1}{2}$ inch basal tube, upper wider part 1 inch, and rounded crenate lobes. Outer stamens much longer than inner, filaments hairy. Leaves ovate acute, shortly cuneate at base up to 7 by 4 inches. Bedd. Ic. Pl. Ind. Or. C.C.I.

Nilgiris: in sholas at 7,000 to 8,000 feet; flower 1883. Coonoor 1918.

9. **Strobilanthes neilgherrensis** *Bedd.* Ic. In. Ort. CXCVI ; *F.B.I.* iv 438, XVIII 26. Flowers white, similar to the last, but larger, the broader part of the tube $\frac{3}{4}$ inch, lobes rounded. Bracts and bracteoles linear, $\frac{3}{4}$ inch, hairy. Sepals with scarious margin. A large shrub.

Pulneys and Western Ghauts to 6,000 feet.

10. **Strobilanthes Wightianus** *Nees ; F.B.I.* iv 438, XVIII 24. A coarsely hairy shrub of 2 to 3 feet : young parts covered with short deflexed hairs. Leaves in the flowering part $\frac{1}{2}$ to 2 inches, nearly sessile with stalks half as long ; ovate acute, thick, roughly hairy, finely serrate. Flowers in shortly stalked axillary bunches. Bracts $\frac{3}{4}$ to 1 inch, elliptic, acuminate, longer than the sepals : bracteoles $\frac{2}{3}$ inch, narrow. Sepals linear. Corolla campanulate, $\frac{3}{4}$ to 1 inch, with narrow part of tube very short, nearly glabrous outside, hairy on lines inside : tube brown, limb spreading very pale blue with darker veins. Stamens 4, nearly equal ; pollen grains ellipsoid with ribs and tubercles. Ovary glabrous. Capsule $\frac{1}{3}$ inch oblong, four-seeded. Seeds $\frac{1}{10}$ inch, thin, elliptic, glabrous. **t. 388.** Wt. Ic. 1514.

Nilgiris : near Ootacamund, etc. September 1908 to January 1909. Kotagiri, September 1910.

Frequently in flower.

11. **Strobilanthes urceolaris** *Gamble ; Kew Bull.* 1923, *p.* 374. An erect shrub, very low in open places, in the forest with long internodes. Flowers in hairy heads. Corolla with short basal tube and longer broader part (as in the last species). Stamens 4, in unequal pairs ; bracts obovate crenate. Sepals linear obtuse. Leaves up to 3 by 2 inches with 6 to 7 pairs veins.

Nilgiris : about Ootacamund 7,000 to 8,000 feet. Also on lower slopes of Pulneys, etc.

12. **Strobilanthes sessilis** *Nees* : *F.B.I.* iv 450, XVIII 69. Flowers in close spikes as in S. Kunthianus but whole plant hairy and leaves broadly ovate or cordate, not white below.

Rootstock woody : stems numerous, unbranched, 8 to 18 inches covered with rough hairs. Leaves sessile, 1¼ by 1 inch, ovate with cordate or straight base, crenate, softly villous. Spikes 1½ to 2 by ½ inch : bracts closely imbricate, ovate, acuminate, ½ inch. Corolla 1½ inches, tubular, pale purple. Stamens four. **t. 389.** Wight Ic. t. 1511.

Nilgiris : on the downs ; flower Naduvattam, September 1931.

Gen. Dist. Mountains of South India. Not collected on Pulneys.

In full flower summer of 1904. Other flowering periods appear to have been 1838, 1847, 1849, 1850, and at Avalanche 1852, so flowers almost every year.

13. **Strobilanthes asper** *Wight.* ; *F.B.I.* iv 452, XVIII 68. Characterized by the spikes of flowers being fascicled at the ends of slender axillary peduncles which may have one or two pairs of small bracts below. Leaves ovate or elliptic, acuminate, coarsely serrate, scabrid on both sides, and very much lineolate on the upper, by the sub-epidermal linear crystals. Peduncles 1 to 3 inches. Spikes ½ to ¾ inch shortly stalked. Bracts ⅓ inch ovate acuminate ; bracteoles and sepals about as long narrower both glandular with reddish hairs. Corolla ¾ inch, lower tube as long as the upper ventricose part which is bent at the junction to face outwards (as in S. pulneyensis **t.** 386). Capsule ⅓ inch, oblong. Seeds when wetted elastically hairy.

Nilgiris : on the western borders—Naduvattam and above.

14. **Strobilanthes Zenkerianus** *I. Anders ; F.B.I.* iv 439, XVIII 28. Flowers in erect spikes which lengthen and become cylindrical. Quite glabrous. Leaves often in threes, elliptic acuminate 1¼ to 2½ by ¾ to 1½ inches of plants in shade much larger than of those in the open, glabrous but very lineolate on the upper side when dry. Bracts green spreading with purple patch at the base. Corolla basal tube ½ inch tube, upper broader part ¾ inch distinctly exserted beyond the sepals ; which are longer than the bracteoles but shorter than the bract ; mouth of corolla as long or longer, ½ inch wide, pale purplish blue at tips of lobes. Bracts, bracteoles and sepals glandular hairy in fruit. **t. 390.**

On both plateaux, Nilgiris flower Dodabetta, October 1915, September 1931 ; Coonoor, October 1918. Pulneys, Shembaganur, July 1910. *F.M.P.* gives 1883—85, 1916 ; and period " perhaps rather long and doubtful."

15. **Strobilanthes micranthus** *Wt. Ic. t.* 1519 *! ; F.B.I.* iv 444, XVIII 44. A low soft-stemmed or shrubby plant with large leaves and deflexed spikes, remarkable for their long lanceolate bracts (up to 1 inch). Leaves ovate, acuminate with decurrent base, up to 6 by 3 inches, thinly pubescent ; veins 10 to 15 pairs. Heads solitary, nodding. Bracts ⅙ to ¼ wide at base, tapering. Corolla ½ inch basal tube very short, upper part campanulate, said to be reddish. Stamens 4 exserted. In sholas above 6,000 feet. Flowered 1870, 1885, 1917, 1914 in Governor's shola (E.T.B.).

16. **Strobilanthes luridus** *Wight. ; F.B.I.* iv 450, XVIII 64. A stout straggling shrub remarkable for the flowers being in erect spikes lateral on the old wood, and having very broad bracts. Leaves 6 by 3½ inches,

ovate acute, softly hairy on both sides, finely crenulate. Spike 6 to 10 inches. Bracts $\frac{3}{4}$ inch broadly obovate. Bracteoles and sepals nearly as long, narrow. Corolla 1 to $1\frac{1}{4}$ inches, glabrous outside slightly two-lipped, lurid purple. Capsule $\frac{3}{4}$ inch. Seeds $\frac{1}{6}$ inch across, obovate or nearly circular, very thin. **t. 391**.

Nilgiris : Coonoor on Lamb's Rock Road at 6,000 feet ; flowered 1918.

var. Bourneæ *Gamble.* Bracts, up to $1\frac{1}{4}$ inches wide, bracteoles and calyx very glandular. Pulneys : in Periya shola. **t. 391.**

17. **Strobilanthes homotropus,** *Nees ; F.B.I.* S. sexennis iv. 474, XVIII 139. Flowers white (*F.M.P.*) or pale blue (October 1931) in axils of bracts the pairs well separated, forming large open panicles. Leaves narrow elliptic acute, decurrent on the peteole and sessile or with auricled base, serrate, glabrous but lineolate. Bracts ovate acute. Corolla-basal tube very short ; swollen part campanulate, curved, lobes of limb notched. Stamens 4 in unequal pairs. Pollen grain ellipsoid. A very large shrub 25 to 30 feet high : old trunk 2 to $2\frac{1}{2}$ in. in girth. Young branches 4-angled, glandular pubescent. **t. 392**. Bed. Ic. Pl. In. t. CC VI.

Nilgiris : on Dodabetta, September 1931. Pulneys, fairly common. Beddome's figure gives the bracts as narrow but he says they are variable.

18. **Strobilanthes violaceus** *Bedd.* Ic. t. CC V., *F.B.I.* iv 474, XVIII 140. Similar to S. homotropus but the leaves ovate, acute, up to $6\frac{1}{2}$ by 4 inches with harsh pubescence ; veins 10 to 15 pairs. Inflorescence very glandular. Bracts $\frac{1}{5}$ inch and bracteoles linear, very hairy : sepals obtuse. Corolla bluish purple, 2 inches,

curved, covered inside with downward pointing hairs. Stamens 4 in unequal pairs. A very beautiful species.

Nilgiris: Heads of Sispara Ghauts and Bangitappal, flower 1870, 1883. Flowers rarely.

19. **Strobilanthes amabilis** *Clarke*, *F.B.I.* iv. 476, XVIII, 146. Similar to the two last, but leaves elliptic acute or shortly acuminate at each end (not auricled) serrate. Inflorescence very sticky, nodal bracts small. Sepals linear. Corolla 1¼ straight without basal tube, dark pink or purplish (*Wight*). Wt. Ic. t. 1507 (*Leptacanthus Walkeri*).

BARLERIA.

Shrubs with opposite leaves and showy flowers. Sepals four, two outer larger than the two inner. Corolla lobes imbricate in bud. Stamens two perfect, two small and rudimentary, sometimes a fifth (also rudimentary) present. Ovary with two ovules in each cell only.

Species 100, mostly in the warm parts of the Old World.

Some of the species flower only when several years old and then die, so flower profusely at long intervals, as with STROBILANTHES.

Barleria involucrata *Nees.*; *F.B.I.* iv 483, XXII 10. A small shrub or herb. Leaves elliptic, narrowed to the base, with scattered hairs and raphides on the upper surface, and hairy on the nerves of the lower. No bracts; bracteoles 2, lanceolate acute, much shorter than the two large lanceolate acute sepals which are an inch or more long and densely covered with yellow hairs. Corolla blue, tube 1¼ inches, lobes as long. **t. 393.**

Pulneys: Tiger shola, 5,500 feet. Nilgiris.

ASYSTASIA.

Weak-stemmed shrubs with opposite leaves, and terminal one-sided racemes of flowers. Corolla lobes imbricate in bud. Stamens four. Capsule with four seeds only.

Species about 20, in the tropics of the Old World.

Asystasia crispata *Benth.* ; *F.B.I.* iv 494, XXV 5. Leaves elliptic, ovate or oblong, acute. Corolla $1\frac{1}{2}$ inches white with pink or purple marks on the palate. **t. 394.**

Nilgiris : Kotagiri, Coonoor and below. Pulneys : on the ghaut path. Except in colour very similar to the light yellow A. gangetica *T. And.* of Madras hedges. Shevaroys.

ANDROGRAPHIS. F.B.I. 109 XXVIII.

Distinguished from all our other genera of this order by the two stamens with their broad, stiff, white filaments, and jet black anthers, projecting out from the widely open corolla ; the style between or below them. Herbs or shrubs, erect or procumbent. Leaves entire. Flowers often in one-sided racemes forming large terminal panicles. Capsule narrow-oblong, twice as broad as thick, the septum across the narrower diameter.

Species 18 to 20 confined to tropical Asia, and mostly to India.

Andrographis Neesiana *Wt. Ic. t.* 1561 A. lineata *Nees* in *Wall. Cat.* 2486 ! *Herb. Wight* ; *F.B.I.* iv 504, XXVIII 13. Stem and branches up to 2 feet, stiff, prominently four-angled ; youngest parts covered with glandular hairs. Leaves elliptic or ovate-oblong, glabrous, but when dry roughened by raphides below the surface. Flowers in one-sided racemes in the axils of the upper and

smaller bract-like leaves, all green parts very glandular, forming dense terminal panicles. Pedicels $\frac{1}{16}$ inch. Calyx teeth longer than the tube. Upper and lower lips of the corolla widely separated. Stamens and style pointing stiffly outwards, and bisecting the angle between the lips ; filaments white, thick, ciliate with deflexed hairs ; anthers jet black, glabrous except for a tuft of white hairs at the base. Capsule glandular, oblong, pointed at each end. **t. 395.**

Nilgiris : near Ootacamund on Dodabetta, Lovedale, etc. Pulneys : on the downs.

A. affinis *Nees ; Wall. Cat.* 2486 a *ex parte,* seems to be a small plant of this.

Andrographis stellulata *C.B. Clarke ; F.B.I.* iv 504, XXVIII 12. Differs from A. Neesiana in the leaves being strigose above, tomentose below, and without raphides, and the sepals, setaceous over $\frac{1}{4}$ inch and spreading corolla $\frac{2}{3}$ inch.

Nilgiris : at 6,000 feet.

Andrographis affinis *Nees.* Similar to A. Neesiana, but racemes longer and stems many.

Andrographis producta *Gamble ; F.M.P., p.* 1049. Similar to the above but corolla with a ventricose protuberance.

Andrographis lŏbelioides *Wight, Herb. Prop ! ; F.B.I.* iv 505, XXVIII 14. Remarkable for its short weak stems, small leaves and comparatively large brown flowers.

Rootstock perennial, woody, $\frac{1}{2}$ inch or so thick, vertical. Stems many, 3 to 12 inches, often forking or trichotomous, spreading outwards on the ground, pubescent.

Leaves $\frac{1}{5}$ to $\frac{1}{2}$ inch, ovate-acute, nearly sessile, covered like the branches with gland-tipped hairs. Racemes terminal, often one-sided though the bracts are in opposite pairs : pedicels $\frac{1}{8}$ to $\frac{1}{6}$ inch. Sepals as long. Corolla $\frac{3}{4}$ inch ; limb equal to the tube ; upper lip three-fid, pinkish ; lower two-lobed, purplish brown. Anthers well exserted, white with stiff hairs. Fruit $\frac{5}{8}$ by $\frac{1}{12}$ inch. **t. 396.** Wight Ic. t. 1557.

On the open downs. Nilgiris : Ootacamund to Pykara and Coonoor. Flowering early summer. Not recorded elsewhere.

JUSTICIA. F.B.I. 109 XXXVIII.

Herbs with opposite entire leaves, and terminal bracteate spikes or panicles of violet, rosy, or white two-lipped flowers. Upper lip of corolla inside, the middle lobe of the lower lip outermost, in bud. Stamens two, one-half anther below the other and with a white tail. Fruit a capsule with four seeds.

Species about 100 in the warmer parts of the world.

Justicia nilgherrensis *Wall.; F.B.I.* iv 526, XXXVIII 3. Remarkable for the short fat greyish green spikes, and the comparatively large-mouthed flowers, with broadly-spreading three-lobed lower lip.

Rootstock thick and short with long woody roots. Stems often numerous, procumbent. Leaves $1\frac{1}{4}$ to $1\frac{1}{2}$ by $\frac{1}{4}$ to $\frac{1}{2}$ inch, sessile oblong-lanceolate, obtuse, soft, greyish green in colour, glabrous, minutely punctate, and with finely ciliate margin. Spikes 2 to 4 inches, bracts $\frac{2}{3}$ by $\frac{1}{3}$ inch, ovate, very acute, white but with large green nerves ; bracteoles nearly as large. Sepals five, $\frac{1}{5}$ inch, all equal, linear acute, joined only near

the base. Corolla tube slightly longer, broadening suddenly $\frac{1}{8}$ inch above the base : upper lip $\frac{3}{5}$ by $\frac{2}{5}$ very concave, notched : lower lip $\frac{1}{2}$ inch wide, three-fid ; lobes $\frac{1}{5}$ by $\frac{1}{8}$ to $\frac{1}{6}$ inch, spreading widely ; middle lobe rounded, slightly broader than the lateral. Pod $\frac{3}{4}$ inch, dark purple above, velvetty, laterally contracted at the base. Seeds $\frac{1}{6}$ inch, papillate. **t. 397.**

In the open grass. Nilgiris : on the downs, common ; flowering early summer down to Pykara.

Also reported from Melpat (2,500 feet) in South Arcot.

Justicia simplex *Don ; F.B.I.* iv 539, XXXVIII 49. Stem and branches slender villous, procumbent from a perennial rootstock. Leaves ovate or elliptic, acute or not, entire or minutely waved, $\frac{1}{4}$ to $\frac{1}{2}$ inch, with stalk $\frac{1}{6}$ inch ; covered as are all green parts with white hairs $\frac{1}{8}$ or so long. Spikes terminal, erect, $\frac{1}{2}$ to 2 inches by $\frac{1}{4}$ inch : bracts and sepals $\frac{1}{6}$ inch, narrow hairy. Corolla $\frac{1}{4}$ inch pink. Fruit elliptic $\frac{1}{5}$ by $\frac{1}{8}$ inch, papery, glabrous. **t. 398.**

In the open grass. Nilgiris : on the downs, on the banks and sides of cattle-tracks, etc., common from Ootacamund to Pykara, flowering May to September. Pulneys : in sholas on the downs and below.

Gen. Dist. Widely distributed over India from Kashmir to Travancore. Also Abyssinia, Malay States, etc.

Don's description was based on a Nepal plant of Wallich's. The Nilgiri specimens are smaller but otherwise, I think, not in any way different.

Justicia latispica *Gamble ; F.M.P. p.* 1080 *; F.B.I.* as J. procumbens var. lastispica iv 539, XXXVIII 50. Similar to the above but woody below, bracts linear pectinately ciliate. Corolla pale lilac, spotted white. Wt. Ic. t. 1539.

Western Ghauts, Nilgiri hills above 5,000 feet [*F.M.P.*].

RUNGIA. F.B.I. 109 XLVI.

Herbs often small and creeping with entire leaves and one-sided spikes of two rows of bracts of which however often one row only has flowers in our species both : distinguished by the broad white margin to the bracts. Corolla two-lipped ; upper lip inside ; lower outside in bud. Stamens two, anthers equal one lower than the other. Seeds four to the capsule.

Species 20 nearly all in India, 2 in Africa.

Rungia læta *Clarke ; F.B.I.* iv 546, XLVI 3. Distinguished among all our plants by the broad white margins to the bracts.

Stem terete, bent at the nodes. Leaves acute at both ends ovate elliptic, 2 to 4 by $1\frac{1}{4}$ to 2 inches, narrowed to the $\frac{1}{4}$ to $\frac{3}{4}$ inch stalk. Racemes axillary, $\frac{1}{2}$ to 2 inches, with one or a few pairs of empty smaller bracts at the base. Flowering bracts ovate-acute, $\frac{1}{2}$ to $\frac{5}{8}$ by $\frac{1}{3}$ inch, thin with broad pinkish margin. Sterile similar. Corolla lips divergent. Anthers $\frac{1}{4}$ inch, under the end of the upper lip. Fruit $\frac{1}{3}$ to $\frac{1}{2}$ inch, obovate, pubescent ; valves very elastic. Seeds two in a cell, dark brown, papillose. **t. 399.**

Pulneys : in the Kodaikanal shola. Not Nilgiris.

The species was founded by Clarke on a small piece 6 inches long without fruit.

Rungia latior *Nees. ; F.B.I.* iv 546, XLVI 4. Spikes shorter, up to 1 by $\frac{1}{2}$ inch ; bracts obovate, rounded, $\frac{1}{4}$ by $\frac{1}{3}$ inch, with broad scarious margin, the sterile slightly different. Corolla $\frac{1}{3}$ inch, upper lip acute. Wt. Ic. 1548.

Western Ghauts. Nilgiris, etc., 3,000 to 6,000 feet [*F.M.P.*].

VERBENACEÆ.

Herbs, shrubs or trees. Leaves opposite or in threes. Flowers nearly regular. Five-lobed or two-lipped. Stamens four only. Ovary superior two-carpelled containing more than four seeds, whose micropyle (and radicle) points downwards. Inflorescence cymose or racemose. Fruit fleshy or dry, with two or four hard stones enclosing the seeds.

About 67 genera and 750 species almost all tropical and sub-tropical.

KEY TO THE GENERA.

a { Flowers in spikes, nearly regular . . . . . . *b*.
Flowers in cymes disposed in panicles, 2-lipped.
p. 461. CLERODENDRON.

b { Spikes short, stems prickly : fruit fleshy . . LANTANA.
Spikes 2 to 4 inches ; leaves oblong, serrate . VERBENA.
Spikes 6 to 12 inches, leaves ovate, crenate.
p. 460. STACHYTARPHETA.

LANTANA.

Shrubs. Flowers in very short spikes. Fruit a berry.

Species about 50 in the tropical and sub-tropical regions.

Lantana aculeata *Linn.* ; *F.B.I.* iv 562, I * : L. camara *L.* The Lantana. A strongly scented shrub, climbing by recurved prickles on the angles of the branches. Flowers orange or red and pink. Fruit a black berry.

Introduced from tropical America and now in all parts from the plains to about 5,000 feet. The red or orange and the pink varieties though often growing together appear to be distinct. At the beginning of this century the Lantana of the plains (e.g., about Madras) was all pink, that of the lower hills orange or red. Both sorts now grow together in Madras and in Coonoor.

STACHYTARPHETA.

Herbs. Flowers in long spikes. Corolla tubular. Stamens 2. Fruit dry separating into 2 one-seeded parts.

Species about 45 in the warmer parts of the world.

Stachytarpheta mutabilis *Vahl.* Flowers in long spikes of 1 to 2 feet, pink mauve or blue, and varying in size. Leaves ovate sharply toothed.

A garden escape, common on the Shevaroys about Yercaud. S. indica, a smaller plant with blue flowers is common on the plains.

VERBENA. F.B.I. III VII.

Pubescent herbs or undershrubs with the characters given above for the family. Flowers in terminal spikes, calyx tubular five-toothed and five-nerved. Corolla with slender tube and spreading limb or five nearly equal oblong-obtuse lobes. Ovary of four cells with one erect seed in each. Fruit separating into four stony parts each with one seed.

Species 100 natives mostly of America. V. officinalis, Vervein is widely distributed over the whole world. Here we have only two garden-escapes.

Spikes few, 1 to 2 inches by $\frac{1}{3}$ to $\frac{1}{2}$ inch : corolla tube $\frac{1}{2}$ inch . . . . V. venosa.

Spikes twenty to forty in a large cymose corymb : corolla tube $\frac{1}{8}$ inch . . . . V. bonariensis.

Verbena venosa *Gill and Hooker* ; VII 2. Stem 2 to 3 feet angled, pubescent. Leaves sessile, and clasping the stem by their broad, 3 by 1 inch, elliptic or lanceolate, acute, serrate leaves. Spikes usually 3, lengthening in fruit to 3 inches, peduncled, terminal on the upper axils. Corolla pink, tube $\frac{1}{2}$ inch curved upwards ; limb $\frac{1}{4}$ inch.

Stigmatic lobes small. Fruit egg-shaped, $\frac{1}{8}$ by $\frac{1}{16}$ inch, enclosed in the calyx from which the persistent style still protrudes. **t. 400.**

Native of Brazil. Common at Kodaikanal, where Mr. Tracey of the American Mission tells me it was introduced by him accidentally among grass seed. Nilgiris: Ootacamund, Coonoor, etc., no doubt as a garden-escape.

Verbena bonariensis *Linn.; F.B.I.* iv 565; VII. Flowering part of stem much branched so as to form a large cymosely branched corymb of twenty to forty spikes, which are often in well-marked cymes of three of which the middle spike is sessile, the lateral ones stalked. Bracts $\frac{1}{6}$ to $\frac{1}{4}$ inch. Corolla tube $\frac{1}{8}$ to $\frac{1}{6}$ inch half as long again as the calyx-shaped or broader upwards, with $\frac{1}{8}$ to $\frac{1}{6}$ inch limb. Stigmatic lobes distinct. Fruit enclosed in the calyx which is now a little longer than the bract.

Native of Brazil. Said to occur as an escape on the Nilgiris, but I have not myself seen it.

The figure (214) in my F. N. & P. Ht. Vol. II was, I think, of V. venosa in fruit.

CLERODENDRON. F.B.I. III XIV.

Shrubs or trees with the characters given above for the family but the flowers in cymes. Calyx, campanulate and corolla tube slender, with limb of five spreading lobes, more or less two-lipped. Fruit fleshy with four stones.

Species about 70 in warm countries, more especially the east.

Clerodendron serratum *Spreng; F.B.I.* iv 592, XIV 11. A robust shrub with large coarsely serrate leaves, and terminal narrow thyrsoid panicles or spikes

of cymes, 3 to 6 by 2 inches, of blue flowers, with conspicuously wide oblique mouth, and long protruding stamens and style. **t. 401.**

Pulneys : near Kodaikanal on the slopes below the cemetery and near the Ghaut road. Nilgiris : Eastern plateau valley below Snowdon. Not common, Coonoor. Not at highest levels. Shevaroys, near Yercaud, etc.

Gen. Dist. Himalayas to Ceylon, common in Bengal.

LABIATÆ.

Herbs with opposite leaves and cymes of flowers usually in very dense whorls at the leaf-axils or condensed into dense spikes of such whorls, and like BORAGEÆ with fruit consisting always of four separate one-seeded nutlets. Corolla monopetalous, sub-equally five-lobed or strongly two-lipped. Stamens four, in two pairs, attached to the corolla tube differing in position and relative length. Ovary superior seated on a conspicuous disc, of two carpels, but four-celled. Nutlets varying in the position of their attachment to the central axis.

Species 2,000 or more, native mostly of the north temperate regions, especially round the Mediterranean and in Asia Minor and Syria.

This large family is divided into a number of tribes of which the following occur here wild or are common in gardens :—

1. *OCIMOIDEÆ :* perfect stamens four bent down ; anther cells confluent (apparently one only to each anther). Basal scar of nutlet small, e.g., LAVENDULA Lavender, COLEUS.

2. *SATUREINEÆ :* perfect stamens four, the upper (middle) pair longer, or two only straight and diverging. Corolla two-lipped or not, e.g., MENTHA Mint, THYMUS Thyme, CALAMINTHA Catmint.

3. *MONARDEÆ :* perfect stamens two, anther cells of a stamen separated by a short or long filament, and often one sterile or absent, e.g. SALVIA.

4. *STACHYDEÆ :* perfect stamens four, lower (outer) pair longest. Upper lip of corolla hooded, lower lip spreading, three-fid, e.g., SCUTELLARIA Skullcap, BRUNELLA Self-Heal, STACHYS Botony, etc., LAMIUM Dead-Nettle, LEUCAS.

5. *AJUGOIDEÆ :* nutlets with a particularly large oblique or lateral areola by which attached to the central axis, e.g., TEUCRIUM Wood Germander, AJUGA Bugle.

KEY TO THE GENERA.

a { Stamens 4, bent down, anthers opening by one slit, corolla of 5 equal lobes or the lowest flat or concave . . . *b*
Stamens 4, straight, the upper pair longest : anthers with 2 slits: corolla equally 5, lobed or 2-lipped . . *d*
Stamens 4, erect, corolla of 2 lips or of one lower . . *g*

b { Corolla tube long, lower lip flat or nearly so ; calyx bent down in fruit. Flowers few. *p*. 464. ORTHOSIPHON.
Lower lip concave or boat-shaped . . . . *c*

c { Flrs. very small : spike compact *p*. 469. ANISOCHILUS.
Flowers in compound spikes or panicles . . . . *d*
PLECTRANTHUS and COLEUS.

d { Stamens connected by a she th . . *p*. 468. COLEUS.
Stamens not connected . . . *p*. 464. PLECTRANTHUS.

e { Corolla equally 5-lobed : flowers many . . . . . . *e*
Corolla 2-lipped : calyx 13-ribbed : flowers few . . *f*

f { Flower in tight wedge-shaped bunches . . . .
p. 470. POGOSTEMON.
Flowers small in a dense slender spike . . . .
p. 473. DYSOPHYLLA.

g { Calyx 2-lipped, the upper closed down in fruit. . . *i*
Calyx tubular, the mouth straight or oblique. . . . *h*

h { Calyx 5-toothed : leaves ¼ inch or less . . . .
p. 474. MICROMERIA.
Calyx 2-lobed : leaves 1 inch or more . . . .
p. 475. CALAMINTHA.

i { Calyx with a plate on the back. Flowers few. . . .
p. 475. SCUTELARIA.
Flowers in a dense head, with broad bracts between.
p. 477. BRUNELLA.

i { Upper lip of corolla arched over the stamens. . . . *k*
Upper lip flat : anther unequal . *p*. 477. ANISOMELES.
No upper lip, stamen projecting erect , ...
p. 484. TEUCRIUM.

k { Corolla orange : calyx 5 spine-toothed . . LEONURUS.
Corolla white : calyx 10-toothed. . . *p*. 478. LEUCAS.

ORTHOSIPHON.

Whorls few flowered, well separated as long spikes. Flowers of the tribe OCIMOIDEÆ (q.v.). Fruiting calyx deflexed, upper lip broad. Corolla slender, upper lip three to four-fid, lower entire, concave. Stamens 4, declinate ; filaments free ; anther cells confluent. Nutlets ovoid or round, smooth.

Species about 20 in the tropics of the Old World.

Orthosiphon rubicundus *Benth. ; F.B.I.* iv 614, VII 6. Stems 1 to 1½ feet slender, sometimes numerous from old burnt down root-stocks, red. Leaves about 1 inch, ovate, coarsely toothed, with cuneate base ; lower petioled, upper sessile. Flowers ⅓ to ½ inch rose or white.

Nilgiris : on E and N. slopes. Biccapatti.

var. Hohenackeri *Hook f.* A smaller species leaves 1 inch, laxly tomentose. Calyx tube very hispid. Corolla ¼ inch . Nilgiris at 6,000 feet.

PLECTRANTHUS. F.B.I. 112 VIII.

Herbs or undershrubs with flowers in loose cymes not dense whorls, otherwise having the characteristics of the family and tribe 1. OCIMODEÆ (p. 462), and remarkable for the small calyx and much larger corolla, with upper lip of three or four teeth, and lower very concave and boat-shaped, in which lie the stamens.

Species 150, in south and tropical Africa, tropical and sub-tropical Asia, spreading eastwards to Japan, Malacca, Australia and the Pacific islands.

Fr. Germaine, *Ger.* Hahnensporn. Closely allied to COLEUS, in which, however, the filaments of the stamens are united.

KEY TO THE SPECIES.

a { Corolla $\frac{1}{6}$ inch, cylindrical, lobes spreading. Fruiting calyx $\frac{1}{8}$ inch, curved and glabrous, prominently ribbed, its teeth obtuse. Seeds spherical. Leaves thick and tawny . . . . P. nilgherricus.
Corolla campanulate, with lower lobe $\frac{1}{8}$ inch, projecting in fruit. Fruiting calyx $\frac{1}{5}$ inch, curved, prominently ribbed, teeth acute. Seeds oblong. Leaves glabrate. P. Wightii.
Corolla strongly 2-lipped, the lower boat-shaped, the upper reflexed . . . .

b { Calyx equally 5-lobed, in fruit bent down, the sepals acute. Leaves tomentose, white underneath. Panicles large of 4 to 5 inches racemes . . . . P. Coetsa.
Upper calyx-lobe ovate, four lower smaller. Racemes of the thyrsoid panicles, 1 to 2 inches. Fleshy undershrubs . . . . *c*

c { Leaves large up to 10 inches, corolla $\frac{3}{4}$ inch. . . . . . . P. fruticosa.
Leaves 2 to 3 inches, thick. Lower lip of corolla obtuse. Fruiting calyx $\frac{1}{8}$ inch . . . . . P. Bishopianus.
Leaves 1 to $1\frac{1}{2}$ inches thick, roundish. Lower lip of corolla acute. Fruiting calyx $\frac{1}{5}$ inch . . . P. Bourneæ.

Plectranthus Wightii *Benth.*, *Sir F. Adams coll.!* *Herb. Wight* 2096 *!* ; *F.B.I.* iv 619, VIII 12 ; including P. pulneyensis *Hook. f.*, *Herb. Wight* 2096 *!* ; F.B.I. iv 617 ; and P. nepetæfolius *Benth.*, *Herb. Wight* 2507 ! ; F.B.I. iv 619.

Stem 1 to 3 feet, simple or branched : whole plant nearly glabrous, pubescent or softly hairy, and with or without red glands. Leaves up to 5 by 3 inches (F.M.P.) usually much less petioled, thin or thick, ovate, with acute, cordate, or nearly straight base, toothed nearly all round : upper small. Panicle large with foliaceous bracts, which may or may not fall before the fruits mature. Cymes very lax, sometimes $1\frac{1}{2}$ inches. Calyx small $\frac{1}{16}$ to $\frac{1}{12}$ inch ; in fruit $\frac{1}{8}$ to $\frac{1}{6}$ inch, slightly curved and teeth

acute. Nutlets oblong. Corolla white with pink spots, lower lip longer than the tube, concave. Stamens longer. Wight Ic. t. 1429. **t. 402.**

On the downs. Nilgiris and Pulneys, common.

In my F. N. & P. Ht. I united the three species given above and this is confirmed in F.M.P.

Plectranthus nilgherricus *Benth.*, *F.B.I.* iv 619, VIII 13. Similar to the last, but differs in the smaller fruiting calyx, with rounded lobes and round nutlets, and the whole plant densely covered with tawny hairs.

Nilgiris: from the Wynaad to 7,000 feet (*F.M.P.*) near Ootacamund. t. 460 in Vol. III of my F. N. & P. Ht. is not this species.

Plectranthus Coetsa *Buch. Hans*, var. macræi *Hk, f.; F.B.I.* iv 620, as part of P. menthoides *Benth., but not Wall. Cat.* 2744!; VIII 18 *. A stout herb with thick hairy leaves, conspicuously veined, and narrow dense spikes in large terminal panicles 12 to 18 by 6 to 8 inches. Stem 2 to 5 feet, all parts densely villous. Leaves very variable in size, but attaining 3 by 2½ inches, stalked, ovate-acute with rounded or narrowed base, and triangular teeth, softly pubescent on both sides; upper surface divided into small areas by the impressed veins. Bracts numerous like small leaves, sometimes larger towards the top. Calyx hardly two-lipped; in fruit villous. Nutlets oblong. **t. 403.** Wight Ic. t. 1430.

On the downs of both plateaus, in moist places and on the banks of ditches.

Plectranthus coleoides *Benth.; F.B.I.* iv 622 VIII 27. Stem 1 to 2 feet, erect, succulent, green, spotted with purple; pubescent above, as are the leaf-stalks, underside of leaves, and the inflorescence. Leaves 1½ to 5 inches, broadly ovate, obtuse, with rounded or cordate base, and crenate margin. Inflorescence 4 to 8

inches (12 × 8 *F.M.P.*) typically simple, or branched; bracts rounded, deciduous peduncles 1 to 1¼ inches : purplish. Corolla ⅓ inch, lilac, lower lip ciliate. Nutlets black and shining. **t. 404.** Wight Ic. t. 1433. Bot. Mag. t. 5841.

Nilgiris : near Ootacamund on Snowdon and Kotagiri road, flower July.

Plectranthus fruticosus. *Hook. f.; F.B.I.* iv 623, VIII 29 ; Nettle-leafed Giant Cockspur. Stem stout, to 4 or 5 feet, spongy below. Lealf-stalks 2 inches : blades 3 to 6 inches long and broad, broadly ovate, with large rounded teeth ¼ inch deep, themselves crenate ; when young densely pubescent or tomentose underneath, becoming like the stem nearly or even quite glabrous with age ; thin. Cymes, at least the lower, stalked. Calyx 1/12 inch, teeth nearly equal, upper ovate lower acuminate. Corolla ⅔ inch, with slender tube and inflated mouth, very distinctly two-lipped, much decurved.

Pulneys : Kodaikanal, by roadsides in rich cool soil. Banks of lakes and streams. Nilgiris.

Plectranthus Bourneæ *Gamble.* A large succulent undershrub, with rather small, roundish, fleshy, whitish or tawny-tomentose leaves, and compact thyrsoid panicles of flowers. **t. 405.**

Pulneys : near Kodaikanal by streams especially in rocky places. Nilgiris : Coonoor.

Plectranthus Bishopianus *Gamble.* A large slightly fleshy undershrub. Leaves up to 3 inches by 2 ovate. Thyrsoid panicles up to 10 inches, the racemes very slender. Fruiting calyx scarcely ¼ inch, corolla ½ inch, lower lip subobtuse.

Pulneys : near Pillar Rocks [*F.M.P.*].

COLEUS. F.B.I. 112 IX.

Flame-Nettle.

Herbs, shrubs or trees with the characters of the family and tribe 1. OCIMOIDEÆ (p. 462), and remarkable for the often coloured bracts and the large underlip of the corolla in which lie the stamens, and peculiar in the filaments of the stamen being connected together at the lower end into a sheath split down the upper side and wrapping round the style.

Species about 120 in tropical and sub-tropical regions of the Old World especially Africa, the India and Malay Archipelago, and extending to Australia and the Pacific islands.

C. bicolor and C. laciniatus are cultivated in gardens. *Ger.* Buntlippe.

Ring of white hairs in the root of calyx, upper lip in fruit ovate, acuminate . . . . C. barbatus.

No hairs in calyx, its upper lobe in fruit rounded and reflexed. C. malabaricus.

Coleus barbatus *Benth.; F.B.I.* iv 625, IX 2 Stems softly hairy, from a thick perennial rootstock. Leaves 3 to 5 inches by $1\frac{1}{2}$ inches, corolla blue. Calyx hairy inside. Upper lip of calyx broadly ovate, in fruit $\frac{1}{6}$ inch: lower teeth four, as long, slender. Corolla pale blue; upper lip $\frac{1}{8}$ inch, lower $\frac{1}{2}$ inch. Nutlets about $\frac{1}{30}$ inch. **t. 406.** Wight Ic. t. 1432.

Nilgiris: Ootacamund, etc., flowers in August. Pulneys: only at low levels.

Gen. Dist. Himalaya mountains and mountains of Central and Southern India, Poona and Western Ghauts remaining up to our levels.

Coleus malabaricus *Benth.; F.B.I.* iv 626, IX 7. Stem and underside of leaves usually purple, glabrous. Calyx not hairy inside, upper lip acute, corolla pale lilac with dark blue upper lip.

Nilgiris and Pulney plateaus to 6,000 feet.

ANISOCHILUS. F.B.I. 112 X.

Herbs having the characters of the family and tribe I. OCIMOIDEÆ (p. 462), with flowers in dense, long or short spikes. Calyx with truncate or oblique nearly toothless mouth. Corolla small, its slender tube bent down: lower lip boat-shaped: upper of three or four teeth. Stamens bent down inside the lower lip.

Species 20 in India and tropical Africa.

Spikes on short peduncles . . . A. dysophylloides.
Spikes racemed on long peduncles . . A. suffruticosa.

Anisochilus dysophylloides *Bentham, Wall. Cat.* 2756; *F.B.I.* iv 628, X 6. Grows in grey rounded masses a foot or so high on exposed summits and hill-sides; flowering in the winter, in summer showing only thin dried cylindrical fruiting spikes; quite common.

Annual leafy shoots round, silky all over, as also the leaves. Leaves broadly obovate or elliptic, 1 by $\frac{3}{4}$ inch, with shallow crenations in the further half, thick and juicy, aromatic if crushed. Flowers minute, crowded, with broad bracts, into erect cylindrical (compound) spikes 1 to 3 by $\frac{1}{5}$ to $\frac{1}{3}$ inch, calyx thickly covered with small red glands. Corolla $\frac{1}{8}$ inch, its lobes $\frac{1}{30}$ inch, the lowest slightly larger than the others, purple. **t. 407.** Wight Ic. t. 1434.

In dry places, tops of the higher hills, etc., very abundant, e.g., Elk hill and Snowdon near Ootacamund. Also lower down on the Pykara slopes. Flowering December, only old fruiting spikes seen in summer.

The species was founded on a plant of Wight's, and varies slightly. At lower levels, e.g., Coonoor, the leaves are smaller, the spikes narrower and stalked, and the flowers white—this is Wight's plant and he called it *albidus*. The highland form (described above) has thicker leaves and thicker nearly sessile spikes with purple flowers. A specimen of this in Herb. Wight is marked *A. purpurens*.

Gamble has separated this as a variety [*F.M.P.*, p. 1128].

Anisochilus suffruticosa *Wt. Ic. t.* 1437; *F.B.I.* iv 628, X 8. Similar to the above, but the spikes several; racemed on a long peduncle. Corolla white with pale lilac tips to the lips.

Nilgiris: on rocky places on the margin of the plateau —Sispara (*Wight*), Biccapatti (*Fyson*).

POGOSTEMON. F.B.I. 112 XII.

Herbs or undershrubs with the characters of the family and tribe 2. SATUREINEÆ (p. 462), and remarkable for the very dense spikes in which the flowers appear in tight wedge-shaped bunches (reminding one of the spikelets of wheat); and distinguished further by the calyx having five equal teeth, the corolla four nearly equal lobes, by the four straight often hairy filaments and one-celled anthers.

Species 28 to 30 in India, Malaya and Japan.

KEY TO THE SPECIES.

a Spikes 1 to 2 inches shortly peduncled in large panicles. 1. P. pubescens.
Spikes solitary terminal . . . . *c*

b Spikes 1 to 2 inches dense, shortly peduncled . . . . 1. P. pubescens.

c Spikes 2 to 6 inches interrupted, panicle loose . . . . 2. P. Heyneanus.
Spikes $\frac{1}{3}$ thick . . . . *d*
Flowers with long protruding stamens making spike 1 inch thick . . . . 8. P. speciosus.
Flowers more densely hairy, and spikes over 1 inch thick . 9. P. atropurpureus.

d Leaves ovate, toothed, very hairy . 3. P. nilagiricus.
Leaves less so, strongly veined . . . . 4. P. mollis.
Leaves obovate, wedge-shaped at base . 5. P. rotundatus.
Leaves ovate, broader than 3, nearly glabrous . . . 6. P. paludosus
Leaves but calyx nearly glabrous . . 7. P. Wightii.

1. **Pogostemon pubescens** *Benth.; F.B.I.* iv 632. Tall aromatic herb. Spikes $\frac{1}{2}$ to $1\frac{1}{2}$ inches, very dense one-sided shortly peduncled in large terminal panicles. Leaves serrate, ovate, acute at both ends, nearly glabrous. **t. 408.**

Nilgiris: Kotagiri. Pulneys: Kodaikanal. Shevaroys: fairly common.

Gen. Dist. Western Ghauts 3,000 to 5,000 feet.

2. **Pogostemon Heyneanus** *Benth.; F.B.I.* iv 633 as P. potchouli, XII 9. Spikes slender 2 to 6 inches, interrupted the whorls often $\frac{1}{4}$ to $\frac{1}{2}$ inch apart, composed of few clusters. Calyx tube $\frac{1}{8}$ inch, pubescent; its teeth one-third as long acute. Leaves broadly ovate 2 to 4 inches, narrowed to the stalk, nearly glabrous, irregularly toothed. An aromatic herb, the leaves used to keep off insects.

Nilgiris: Kotagiri. Also at lower levels, often cultivated.

3. **Pogostemon nilagiricus** *Gamble, Herb. Wight* 2525! All green parts densely tomentose. Leaf-stalks $\frac{1}{6}$ inch, blade $\frac{1}{2}$ to 1 by $\frac{3}{4}$ inch, toothed. Spikes dense 3 to 6 inches. Calyx $\frac{1}{6}$ inch; teeth slender $\frac{1}{30}$ inch. Corolla white, its tube hardly exserted from the calyx. Filaments of stamens bearded. Wight Ic. t. 1441 (but lower leaves too large).

Nilgiris: Ootacamund, Lovedale, Coonoor, flowering October to March. Apparently only on these hills. *Fyson* 2025.

4. **Pogostemon mollis** *Benth.; F.B.I.* iv 633, XII 17. Leaves smaller and less hairy than in the last. Spikes 2 to 3 inches by $\frac{1}{3}$ inch, the flowers covered with short hairs. Calyx tube $\frac{1}{8}$ inch, hairy, teeth less than half as long.

Nilgiris: Ootacamund downs.

5. **Pogostemon rotundatus** *Benth.*; *F.B.I.* iv 636. Leaves obovate rounded, with wedge-shaped, base crenate, lightly covered with short hairs. Spikes 2 to 3 inches by $\frac{1}{3}$ inch hairy. Calyx as in P. mollis.

Shevaroys: near Yercaud.

Gen. Dist. Deccan.

6. **Pogostemon paludosus** *Benth.*; *F.B.I.* iv 635, XII 14. Stem stiff, erect, nearly or quite glabrous. Leaves similar to P. Wightii but glabrous or nearly so. Spike 3 to 5 inches, solitary and terminal, whorls slightly separated. Calyx $\frac{1}{12}$ inch, hispid all over, less inflated than in P. Wightii and hardly contracted below the mouth: teeth one-third the tube.

Nilgiris: Sispara (Lawson).

7. **Pogostemon Wightii** *Benth.*; *F.B.I.* iv 635, XII 16. Sometimes a stout herb 3 or 4 feet high. Young parts hirsute. Leaves 2 inches, ovate, with scattered hairs on the upper side. Spikes terminal dense, with often a whorl in the axils of a pair of leaves a short distance below. Calyx hairy round the mouth, nearly glabrous and slightly inflated below.

In damp places. Nilgiris, Lamb's Rock Road, Coonoor. Pulneys: Kodaikanal, etc.

8. **Pogostemon speciosus** *Benth., Herb. Wight* 361 *!*; *F.B.I.* iv 637, XII 22. Remarkable for the long stamens which project $\frac{1}{3}$ inch, and give a bottle-brush-like appearance to the spike.

Stem 2 to 3 feet, woody; upper parts, leaf-stalks, and spikes hirsute. Leaf-stalk 1 to 2 inches. Blade $1\frac{1}{2}$ to 3 inches long and nearly as broad, ovate, with crenate margin and cordate or nearly horizontal base; sparingly

hairy on the upper side and on the veins of the lower side. Spikes terminal, 3 to 6 inches; flowers nearly sessile. Calyx tube $\frac{1}{5}$ inch, with teeth more fringed with fine hairs. Corolla $\frac{1}{4}$ inch; its tube narrow $\frac{1}{10}$ inch, broadening above into four nearly equal lobes. Stamens twice as long. **t. 409.** Wight Ic. t. 1443.

In shady and cool places, on the outskirts of sholas, etc. Nilgiris: in and near Ootacamund. Also Anamalais. *Fyson* 2227, 3069.

9. **Pogostemon atropurpureus** *Benth.*; *F.B.I.* iv 636, XII 21. All green parts more densely hairy than the last, and the spike thicker, filaments longer. Stem with reflexed hairs. Leaves black on drying. Calyx $\frac{1}{4}$ inch, densely hairy its teeth $\frac{1}{2}$ the tube, slender.

Nilgiris: Coonoor at 6,500 feet. Sispara Ghaut, 6,000 feet.

DYSOPHYLLA.

Flowers small in long very dense spikes. Corolla minute, not two-lipped. Stamens exserted, the filament very long and bearded.

Species about 15, in tropical Asia and Australia.

Dysophylla auricularia *Bl.*; *F.B.I.* IV 628, XIII 4. Stem and all green parts villous with long hairs. Leaves sessile; 2 by 1 inch, ovate-elliptic, serrate. Spikes terminal, hairy; whorls confluent. **t. 410.**

Nilgiris: on rocky hills, above Coonoor. Pulneys: Machur. Shevaroys: about Yercaud, flowers cold months (sometimes nearly glabrous).

Dysophylla cruciata *Benth.*; *F.B.I.* iv 639, XIII 6. Leaves in whorls of four, about 1 inch, narrow-lanceolate, with recurved edges, stem 2 to 3 feet, hairy all over.

Spikes terminal. Flowers pale purple, with stamens densely pink-hairs. Wt. Ic. t. 1444 (D. tetraphylla).

Shevaroys : on the plateau.

F.M.P. records as from the West Coast, perhaps Malabar. F.B.I. gives : *Gen. Dist.* From Kumaon Himalayas to Nilgiris.

MICROMERIA. F.B.I. 112 XXIII.

Herbs or undershrubs with small leaves and axillary whorls or terminal unbranched, not panicled, spikes ; having the characters of the family and tribe 2. SATUREINEÆ (p. 462), but characterized by the calyx having 5 teeth and 13 ribs (two between the midribs of the three lower teeth, one only between those of the upper). Corolla with flat upper lip and 3 spreading lobes below.

Species about 70, in all regions of the world except Australia and New Zealand. Europe has 40, but there are none in Britain.

Micromeria biflora *Benth.* ; *F.B.I.* iv 650, XXIII 2 ; "Lemon-scented Thyme." Distinguished by its smell, small leaves, and purplish flowers—a pair usually out at a time. Rootstock stout, woody. Stems very numerous, 2 to 6 inches, slender, occasionally branched, glabrous pubescent or sparingly hairy. Leaves $\frac{1}{4}$ inch, ovate acute, subsessile, at internodes of $\frac{1}{4}$ to 1 inch. Flowers in small cymes at the leaf-axils. Calyx slender, $\frac{1}{6}$ by $\frac{1}{20}$ inch. Corolla $\frac{1}{4}$ inch, strongly scented. **t. 411.** Wight Ic. t. 1446, Ill. t. 176 *bis f.* 5.

On the downs, all over in grass, common.

Gen. Dist. Higher mountains of South India, Himalayas from Kashmir to Bhotan. Afghanistan, Arabia, Abyssinia, South Africa.

Micromeria capitellata *Benth.* ; *F.B.I.* iv 650. Differs from the above in its taller stem and larger leaves (up to 1 inch) and densely flowered villous whorls.

Gen. Dist. West Himalayas to West Coast. Nilgiris to 6,000 feet.

CALAMINTHA. F.B.I. 112 XXIV.

Catmin.

Herbs with ovate toothed leaves and loose or dense whorls of purplish flowers, with the characters of the tribe 2. SATUREINEÆ (p. 462), but the calyx two-lipped. Ribs of calyx 13. Corolla much as in MICROMERIA.

Species about 50, in north temperate regions. In Europe about 30. *Eng.* Wild Basil, Basil Thyme, Catmint, etc.

Calamintha umbrosa *Benth.* ; *F.B.I.* iv 650, XXIV 2 ; Catmint. Stem rising to 3 feet, weak at the base, pubescent or sparingly hirsute. Leaves ½ to 1½ inches, ovate, acute, serrate, shortly stalked, pubescent on both sides. Whorls lax or dense flowered in the leaf-axils and at the ends of short branches : bracts subulate. Calyx hairy, ⅙ to ¼ inch, slender, purplish : upper teeth triangular, lower longer subulate. Wight Ic. t. 1447. **t. 412.**

In woods, etc., on the downs.

Very similar to C. clinopodium *Benth.*, the Wild Basil of England, which extends eastwards to Kashmir, and perhaps only a form of it, differing chiefly in the stem being weak at the base and the lower calyx-teeth longer than the upper.

SCUTELLARIA. F.B.I. 112 XXXII.

Skullcap.

Herbs or undershrubs with flowers variously arranged in leafy spikes, racemes, or few at the leaf-axils, and the characters of the family and tribe 4. STACHYDEÆ (p. 462), but with the calyx distinctly two-lipped and closed in fruit, and peculiar in the upper lip, being deciduous and having a large deciduous pouch (skull-cap) on the upper side.

Species 180, all over the world except South Africa and rare in tropical Africa. India has 14, Europe and northern Asia 60. *Fr.* Toque, *Ger.* Lebenkraut.

Leaves ovate, cordate, coarsely crenate . . . S. violacea.
Leaves triangular, ditto . . . . S. Colebrookiana.
Leaves oblong, narrow, entire . . . . . S. rivularis.

Scutellaria violacea *Heyne ; Wall. Cat.* 2136*! ; F.B.I.* iv 668, XXXII 4. Stem $\frac{1}{2}$ to 2 feet. Leaves $\frac{3}{4}$ to $1\frac{1}{2}$ by $\frac{1}{2}$ to $1\frac{1}{4}$ inches, sparingly hairy on both sides. Spikes 6 to 12 inches. Flowers two only at a leaf-axil ; bracts $\frac{1}{6}$ to $\frac{1}{8}$ inch ; pedicles twice as long. Calyx $\frac{1}{12}$ inch. Corolla tube $\frac{1}{2}$ to $\frac{3}{4}$ inch, white tinged with purple or pink. In fruit upper pouched lip of calyx $\frac{1}{4}$ to $\frac{1}{3}$ inch ; lower $\frac{1}{8}$ inch. **t. 413.** Wight Ic. t. 1449, Ill. t. 176 *bis. f.* 7.

In woods and moist shady places, common.

Gen. Dist. Hills of South India and Ceylon.

Scutellaria rivularis *Wall. ; F.B.I.* iv 670, XXXII 13. Stem creeping below, above erect, seldom branched, 6 to 8 inches. Leaves $\frac{3}{4}$ to 1 by $\frac{1}{6}$ to $\frac{1}{5}$ inch, subsessile, lanceolate, obtuse, passing above into the floral bracts. Flowers axillary on short stalks. Corolla $\frac{1}{4}$ inch, blue.

Nilgiris : in swampy ground. Near Ootacamund, Pykara.

Gen. Dist. Nepal, Khasia, Burma, China, South Indian mountains.

Scutellaria Colebrookiana *Benth. ; F.B.I.* as var. of S. violacea. Leaves with rather straight (though crenate) sides and nearly straight base, $1\frac{1}{4}$ by 1 inch, thicker than in S. violacea, softly tomentose. Seeds not spiny.

Pulneys : Poombari valley, etc., at lower levels than S. violacea.

BRUNELLA. F.B.I. 112 XXXIII.

Self-heal.

Small herbs with the characters of the family and tribe 4. STACHYDEÆ (p. 462), but with a distinctly two-lipped calyx closed in fruit (not however deciduous and pouched as in SCUTELLARIA), and peculiar in having large rounded bracts in the dense spikes or heads of six flowered whorls.

Species 2 or 3 only in temperate regions.

Brunella vulgaris *Linn.* ; *F.B.I.* iv 670, XXXIII 1. Rootstock creeping. Stems 4 to 8 inches, erect or ascending. Lower leaves stalked, upper sessile : blades ovate or oblong-ovate, obtuse, entire or toothed, very hairy or nearly glabrous. Spikes 1 to 1½ inches by ¾ inch thick, with a pair of leaves close below. Bracts very broad and rounded, often with purple margin. Corolla ½ to ¾ inch, purple or white : filaments of stamens with a short branch behind the one two-lobed anther. Nutlets oblong. smooth. "Self-heal." **t. 414.** Wight Ic. t. 1448.

On the open downs in grass, common. A variable and widely distributed species.

Gen. Dist. Temperate climates of Europe including England, Asia, North America, Andes, North Africa and Australia.

ANISOMELES.

Herbs of the tribe STACHYDEÆ (p. 462) characterized by the upper lip of the corolla narrow erect, not hooded, and the anthers of the outer pair of stamens one-celled, of the inner pair two-celled. Lower lip of corolla notched. Nutlets smooth.

Species few (under 20) in the warmer parts of Asia and Australia.

Amsomeles indica *O. Kze.*; *F.B.I.* (A. ovata) iv 672, XXXVI 2. A tall herb. Leaves ovate, acute or sometimes acuminate, hairy. Flowers pink or purple in dense hairy whorls, sessile at intervals of ½ to 1 inch on tall spikes, the lower whorls subtended by small leaves. Bracteoles linear. Calyx in fruit hispid, the teeth rather long acuminate.

Shevaroys: Flowers cold weather on roadsides.

Gen. Dist. Over tropical and sub-tropical parts of India.

LEONURUS.

Herbs of the tribe STACHYDEÆ (p. 462) and similar to LEUCAS, but the calyx with five ribs only and its teeth spiny; anthers transverse.

Species about 10 in Europe, Asia and America.

Leonurus sibirica *Linn.*; *F.B.I.* iv 678, XL 12. Leaves deeply incised or pinnatifid, 2 to 3 inches long. Whorls many. Flowers red or orange. Bracts and bracteoles setaceous and spiny. A tall herb reaching 3 or 4 feet.

Nilgiris: Kotagiri.

LEUCAS. F.B.I. 12 XLV.

Woolly or villous herbs and undershrubs with flowers in dense, well-separated, whorls. having the characteristics of the family and tribe 4. STACHYDEÆ (p. 462). Calyx tubular or campanulate, ten-ribbed and eight to ten toothed. Corolla with a hooded upper lip covered with stiff hairs and a spreading lower lip with large middle lobe, in all except one species entirely white. Stamens longer than the corolla tube, conniving at the anthers under the upper lip, the outside pair longest.

Species 50 in Asia and Africa.

KEY TO THE SPECIES.

a	Mouth of calyx straight	*b*
	Mouth of calyx oblique, the upper side longer . . .	*h*
b	Calyx teeth $\frac{1}{8}$ inch, erect. Long-stemmed straggling plants ; flowers few in the whorl	*c*
	Calyx teeth very short and shrubs or undershrubs . .	*d*
c	Leaves triangular, thin (Pulneys) . .	2. L. angularis.
	Leaves, ovate, thick	1. L. marruboides.
d	Leaves entire, narrow. Small silvery golden or greyish green undershrubs	*e*
	Leaves toothed. Herbs or shrubs ; whorls globose .	*g*
e	Foliage golden or brownish : whorls on long stalks . .	4. L. suffruticosa.
	Foliage greyish green : whorl on short stalks	3. L. rosmarinifolia.
	Foliage silvery, leaves often in threes spreading . . .	*f*
f	Hairs of calyx mouth longer than teeth	5. L. helianthemifolia.
	Leaves in threes, hairs of calyx mouth short or absent .	6. L. ternifolia.
g	Leaves lanceolate	7. L. lanceæfolia.
	Leaves ovate, upper lip of corolla brown .	8. L. vestita.
	Leaves ovate, flower white	9. L. lamifolia.
	Leaves elliptic, crenate	10. L. hirta.
h	Leaves long-elliptic, crenate : calyx-teeth spiny . . .	12. L. zeylanica.
	Leaves linear ; calyx teeth short . . .	11. L. linifolia.

1. **Leucas marruboides** *Desf.* ; *F.B.I.* iv 683, XLV 13. Stem and branches four-angled, long and slender, straggling on bushes, etc., and white with a close felt of reflexed hairs. Leaves shortly stalked 1 to 2 by 1 to $1\frac{1}{2}$ inches, ovate cordate, crenate on the upper side rough with the impressed veins ; on the lower white with a dense tomentum. Whorls many-flowered, dense in the axils of the leaves : bracts linear, $\frac{1}{4}$ inch, woolly. Calyx campanulate, $\frac{1}{4}$ inch ; mouth straight, with ten

nearly equal teeth of variable length, not hairy inside. Lower lip of corolla thin.

Nilgiris and less so Pulney, plateaus, flowering in winter months. Shevaroys : Green Hills, etc.

Gen. Dist. Mountains of South India and Ceylon.

2. **Leucas angularis** *Benth.* ; *F.B.I.* iv 684, XLV 14 as var. pulneyensis of the last species. Remarkable for its straggling habit and attaining a height sometimes of 10 feet or even more. Leaves not so thick as the last, acute, sometimes with sides so straight and base horizontal as to be triangular. Flowers usually fewer (two or three only). Calyx-teeth longer, half the tube. Corolla large, 1 inch ; upper lip $\frac{1}{5}$ inch : lower $\frac{3}{4}$ by $\frac{1}{2}$ inch at the widest, with rounded lobes, lateral spreading, falcate ; mid-lobe very delicate in texture and translucent between the lace-like veins. **t. 415.**

Pulneys : Straggling over shrubs and up small trees. Common.

3. **Leucas rosmarinifolia** *Benth.* ; *Wall. Cat.* 2521 ! ; *F.B.I.* iv 685, XLV 19. A small bush with flat top of dark green or greyish erect leaves, in bunches (by development of these of the axillary buds). Whorls at first close down among the leafy branches, with two narrow leaves appearing out of the middle, but in fruit raised a little above the bush. Bracts as long as the calyx, oblanceolate, like it softly villous or silky. Hairs on margin of calyx-mouth white, longer than the teeth. **t. 416.**

Nilgiris : Biccapatti east of Ootacamund. North-east of Ootacamund by the Connemara Road at Marlimund, etc. ; Biccapatti, Kotagiri.

4. **Leucas suffruticosa** *Bentham* ; *F.B.I.* iv 685, XLV 18. Less of a bush than the last, with thick rootstock and numerous stems 4 to 8 inches high, covered like the

leaves with yellow, appressed hairs. Leaves 1 to $1\frac{1}{2}$ by $\frac{1}{8}$ to $\frac{1}{6}$ inch; closely covered, white below between the strongly recurved margins; whorls peduncled 2 to 8 inches above the ordinary leaves, but with two leaves immediately below. Bracts $\frac{1}{5}$ inch, half the length of the calyx, subulate. Calyx campanulate $\frac{2}{5}$ inch, evenly ten-ribbed and toothed, the teeth small, slightly shorter than the bristles. Anthers reddish brown. Nutlets $\frac{1}{8}$ inch, smooth, oblong. **t. 417.** Wight Ic. t. 1454.

In the figure are shown the calyx, also opened showing the nutlets, corolla with hood bent back, and underside of leaf.

Very common in the grass of the downs. Nilgiris: Pykara, Biccapatti, Ootacamund. Flowering from May. Not Pulneys.

This species seems to take near Ootacamund and especially to the north-west, in the direction of Pykara, the place of L. helianthemifolia on the eastern side round Kotagiri. In form and in its habit, among grass, it is very similar, but the general colour is brownish-yellow on dark green, not silvery as the other species, and in fruit especially the long peduncles sufficiently distinguish it.

5. **Leucas helianthemifolia** *Desf.; F.B.I.* iv 685, XLV 20. Hardly a shrub, but stems and branches usually 6 to 18 inches, from a woody base; all green parts covered with silvery white hairs. Leaves two, or more at a node (leaves of the axillary bud), oblong to elliptic, variable in length and width from $\frac{1}{2}$ by $\frac{1}{6}$ to $1\frac{1}{2}$ by $\frac{1}{8}$ inch, strongly one-nerved, with recurved margin and densely white tomentose under surface. Whorls many-flowered, solitary or few, with one or two pairs of linear leaves close below, and often also a pair in the centre above. Bracts linear, half the calyx. Calyx tube $\frac{1}{3}$ to $\frac{1}{4}$ inch, straight shaggy; teeth small, hairs of mouth longer. Nutlets $\frac{1}{8}$ inch, oblong. **t. 418.** Wight Ic. t. 1453.

On the open downs. Nilgiris: more common on the drier side, between Ootacamund and Kotagiri. Flowers summer months.

6. **Leucas ternifolia** *Desf.*; formerly included in L. helianthemifolia but differs in the hairs of the branches and leaves, which are usually in threes, being shorter (more like a velvet) the hairs on the mouth of the calyx short or absent. In dried specimens the leaves appear broader, more pointed and dark, and the calyx broader.

Pulneys: on the downs common.

7. **Leucas lanceæfolia** *Desf.*; *F.B.I.* iv 685, XLV 21. Stem 4 to 8 feet coated with reddish yellow tomentum. Leaves lanceolate, 2 to 4 by ½ to 1¼ inches, pubescent and drying black above, white tomentose underneath, with distinct nerves and veins; not quite entire, but notched at ¼ inch intervals: odour strong and disagreeable. Whorls many-flowered and very dense, usually three or four to a branch, the lower with fair-sized leaves just below. Calyx straight; mouth without hairs. Corolla white, or the lower lip cream-coloured: upper lip as in L. suffruticosa. **t. 419.** Wight Ic. t. 1452.

Nilgiris and Pulneys: by the margins of sholas, quite common and often in thick clumps; flowers summer and autumn. On these hills only.

8. **Leucas vestita** *Benth.*; *F.B.I.* iv 686, XLV 25. Distinguished from all our other species by the brown upper lip of the corolla; whorls large and spherical, and stem 2 to 4 feet, shaggy with red or brown hairs. Leaves 3 by 1½ inches, with ½ inch stalk, ovate, acute at both ends, coarsely serrate, shaggy above and tomentose below. Whorls 1 to 1¼ inches across, in the axils of the ordinary leaves. Bracts ½ to ¾ inch, one-nerved, ciliate. Calyx-tube slightly shorter: mouth quite straight with erect hairs of ⅛ inch, and slightly longer linear ciliate teeth.

Corolla exserted, upper lip hooded, rich brown, lower white. **t. 420.**

Pulneys : on the open hill sides above Silver Cascade, etc., Kukal, and at lower levels but not seen on the higher downs. Not collected on Nilgiris.

Gen. Dist. Pulney and Travancore hills.

9. **Leucas lamifolia** *Desf. ; F.B.I.* iv 686, XLV 24. A tall shrub, up to 8 feet high, with ovate crenate or serrate leaves 3 to 5 inches long, covered with long brown hairs. Whorls dense globose. Calyx $\frac{1}{2}$ inch, its teeth slender $\frac{1}{6}$ inch, and mouth-hairs short or absent. Corolla small. Upper lip white. Nutlets $\frac{1}{8}$ inch, oblong. **t. 421.**

Nilgiris : 6,000 to 7,000 feet. "Common in old Forest, Coonoor" [*F.M.P.*]. My specimen is without locality.

10. **Leucas hirta** *Spr. ; F.B.I.* v 687, XLV 26. Stems 2 feet. Leaves 1 to 2 inches, elliptic, crenate except on the cuneate base, rather thick and covered with yellow hairs on bulbous bases. Calyx teeth about $\frac{1}{20}$ inch, curved back. **t. 422.**

Shevaroys : near Yercaud. Flower January.

Gen. Dist. Mysore and the Deccan, Horsleykonda, Western Ghauts, Tinnevelly.

The leaves dry yellow unlike those of L. vestita of which Hooker in F.B.I. suggested it might be a dry-country form.

11. **Leucas linifolia** *Spreng. ; F.B.I.* iv 690, XLV 38. Stem 1 to 2 feet. A herb up to $1\frac{1}{2}$ feet, well branched. Leaves linear $1\frac{1}{2}$ to 2 inches by $\frac{1}{8}$ to $\frac{1}{6}$ inch, entire or slightly serrate. Whorls at the ends of the branches. Calyx with very oblique mouth, the upper tooth much longer and acute pubescent. Corolla with long lower lip. **t. 423.**

Coonoor, Yercaud. Mostly at lower levels—Deccan, the Carnatic, etc.

12. **Leucas zeylanica** *R. Br.* ; *F.B.I.* iv 698, XLV 33. A tall herb, calyx hispid, oblique at mouth, the teeth long and spiny. Leaves narrow elliptic, 2 to 4 by ¼ to ½ inch, distinctly serrate pubescent. Bracteoles linear.

Nilgiris : Coonoor, Kotagiri. Shevaroys.

TEUCRIUM. F.B.I. 112 LIII.

Flower peculiar in having no upper lip, but in its place a notch through which are exserted the 4 long curved stamens, a large lower lip with minute or obsolete side lobes and large midlobe, and minute nutlets with comparatively very large hilum. Calyx with 10 ribs and 5 nearly equal teeth. Herbs or shrubs of the tribe 5 AJUGOIDEÆ (p. 463).

Species about 100, mostly in temperate and southern Europe. In England 3 species. 'Wood Germander,' etc.

Teucrium Wightii *Hook. f.* ; *F.B.I.* iv 701, LIII 6. A stout stemmed herb with soft rather thick leaves and pale purple flowers in long spikes terminating the upper axillary branches, and so forming large terminal panicles. **t. 424.** *a* corolla, etc. ; *b* calyx showing nutlets and hairs inside the tube [*E.T.B.*] ; *c* nutlet [*F.*].

In rocky places. Nilgiris : on Dodabetta and near Ootacamund, flowering from March to June.

PLANTAGINACEÆ.

A family of practically only one genus, of about 200 species ; the two other genera having but one species each.

PLANTAGO. F.B.I. 113 I.

Annual or perennial herbs with radical leaves, and spikes of small flowers on long leafless stalks (scapes),

peculiar in having a scarious monopetalous corolla with four small lobes, and a thin-walled egg-shaped capsule which opens by a circular transverse slit. Sepals four, imbricate. Stamens four with long filaments and round anthers, attached to the middle of the corolla tube. Ovary superior two-celled, with one or more ovules. Seeds angular subglobose or compressed, plane or concave on the hilum side. Embryo straight, radicle pointing downwards.

Species 200, all over the world, chiefly in temperate climates ; but not absent from hot dry countries nor from the tops of mountains. In England 5 species, Plantain, Ribwort, Waybread ; *Ger.* Wegerich, Wegetritt.

Plantago asiatica *Linn. ; F.B.I.* as included in P. major L. iv 705, I 1. Perennial by a stout rootstock. Leaves all radical, stalked, oblong or oblong-ovate, very variable in size, from blades of 1½ by ¾ inch with stalks ¾ inch, to blades 4 by 3 inches with stalks 8 inches, entire or toothed, three to five-nerved. Spikes 1 to 8 inches. Flowers scattered or crowded. Bracts variable as long as or shorter or longer than the $\frac{1}{12}$ inch sepals. Capsule ⅙ to ⅕ inch, egg-shaped. Seeds small black, attached to the top half. **t. 425.**

In waste places and roadsides as a weed Ootacamund, Coonoor, Kodaikanal, Shembaganur, etc., and closely allied to P. major *L.* which occurs wild or introduced in many parts of the world.

In the figure : *a* flower ; *b* fruit opened, showing the seeds adhering to the top part [E.T.B.].

Plantago lanceolata *Linn.* ; similar to the above but with narrow lanceolate leaves, occurs as an introduced weed. It is the common English " Ribwort."

AMARANTACEÆ.

Herbs with alternate or opposite leaves and terminal or axillary spikes of flowers, with one whorl only of perianth (the sepals) and three scarious bracts and bracteoles; as many stamens opposite the sepals, sometimes united by a membranous cup at the base, or with intervening staminodes, and a dry papery fruit with usually one erect black shining seed inside which the embryo lies curled round the endosperm.

Genera about 50, species 500 in the tropical and sub-tropical countries.

KEY TO THE GENERA.

a	Leaves alternate	*b*
	Leaves opposite	*c*
b	Spikes long. Seeds many	CELOSIA.
	Flowers in clusters. Seeds one only, erect .	ALLMANIA.
c	Spikes long, fruiting flowers deflexed .	ACHYRANTHES.
	Fls. in axillary heads; anthers 1-celled .	ALTERNANTHERA.

CELOSIA.

Herbs with alternate leaves, flowers solitary or in clusters in short or long spikes, silvery or pink, and many seeds in the fruit.

Species 35 in the tropics.

Celosia pulchella *Moq.; F.B.I.* iv 715, II 3. Spikes 4 to 8 inches, the flower or small clusters $\frac{1}{4}$ by $\frac{1}{2}$ inch apart. Sepals $\frac{1}{10}$ to $\frac{1}{6}$ inch, capsule ovoid narrowed upwards. Style two-fid. Leaves lanceolate 2 to 4 by $\frac{1}{2}$ to $1\frac{1}{2}$ inches; petiole $\frac{1}{2}$ to 1 inch.

Pulneys: Shembaganur. Also Horsleykonda and Deccan.

ALLMANIA.

Flowers in a head ; anthers two-celled : ovary with one erect seed which has an aril : capsule circumciss. Herbs with alternate entire leaves.

Species about 5 only, in the tropics of Asia.

Allmania nodiflora *R.Br. var.* angustifolia ; *F.B.I.* iv 717, V 1. Stem simple, erect 3 to 8 inches or more. Leaves 2 to 3 inches by $\frac{1}{4}$ inch acute at each end, glabrous. Flower head a cluster about $\frac{1}{4}$ inch diameter, white.

Nilgiris : summit of Karbetta near Kotagiri 6,700 feet (Sedgwick in Herb. Pres. Coll., Madras).

Gen. Dist. Carnatic and Deccan.

ACHYRANTHES. F.B.I. 116 XV.

Characters as above. Leaves opposite ; spikes very slender. Flowers reflexed, with bract and bracteoles. Sepals spiny. Stamens connate at the base with many staminodes each of which has a toothed scale at the back.

Species about 15.

Achyranthes aspera *Linn.* ; var. **rubro-fusca** ; *F.B.I.* iv 730, XV 2. Stem 1 to 3 feet simple reddish leaves elliptic, variable, usually thick and tomentose or velvetty. Spikes rigid lengthening as flowers open. Flowers $\frac{1}{6}$ inch hardening as the seeds set. Bracteoles ovate half as long as their spine. Stamens 5, staminodes fimbriate.

Nilgiris : at Coonoor, Ootacamund.

Gen. Dist. Of species all districts on the plains.

Achyranthes bidentata *Bl.* ; *F.B.I.* IV 730, XV 2. Very similar to the preceding, but the two bracteoles of

each flower reduced to small spines without any blade, and staminodes not fimbriate. Flowers $\frac{1}{4}$ inch. Leaves acuminate. **t. 426.**

Nilgiris: Ootacamund, Kotagiri in Longwood shola, etc. Pulneys: Shembaganur valley in Tiger shola 5,400 feet. Shevaroys: Yercaud plateau. Flower, cold months; also Horsleykonda.

Gen. Dist. South Indian hills about 4,000 feet.

ALTERNANTHERA.

Anthers of one cell only; ovary with one seed suspended from the top: flowers in heads or very short spikes. Herbs with opposite leaves.

Species 20, in the warmer parts, especially of Australia and America.

Alternanthera triandra *Lamk.; F.B.I.* as A. sessiles *R.Br.* iv 731. A weak-stemmed herb of wet places, rooting at the nodes. Leaves 1 to 2 by $\frac{1}{4}$ to $\frac{1}{2}$ inch, elliptic, obtuse. Flower-spikes $\frac{1}{4}$ to $\frac{3}{8}$ inch, sessile in the axils. Stamens 3, capsule flattened broadly obcordate, about $\frac{1}{10}$ inch.

Shevaroys: by the Yercaud lake.

Gen. Dist. All over plains.

CHENOPODIACEÆ.

Herbs with simple alternate leaves, usually covered as also the flowers with a white mealy powder. Flowers with small sepals, no petals. Stamens 5, no staminodes. Ovary with 1 ovule, in fruit usually enclosed in the fleshy calyx. Embryo simply or spirally curled round the endosperm.

Genera 75, species 500, most of them in salty places, sea marshes, etc.

Well-known plants are BETA, cultivated as a vegetable and the source of Beet-sugar ; SPINACIA, spinach ; SALICORNIA Glasswort.

CHENOPODIUM. F.B.I. 1172.

Erect or prostrate herb, stem angled. Flowers minute. Embryo curled round the endosperm.

Species 60, in temperate climates.

Chenopodium ambrosioides *Linn.* ; *F.B.I.* v 4 117. A tall well-branched herb, leaves lanceolate but much cut or coarsely toothed, scented by oil glands. Flowers in small, $\frac{1}{10}$ inch, clusters on the short branches of slender axillary panicles 6 inches long, forming a large terminal, leafy panicle. Leaves elliptic 1 to 4 inches entire or coarsely toothed.

Nilgiris : Ootacamund, Kotagiri, Coonoor, etc. A weed of cultivation. Shevaroys : Yercaud.

PHYTOLACCACEÆ.

A family of 20 genera and 60 species, in tropical and temperate climates.

PHYTOLACCA. F.B.I. 118 I.

American Nightshade, Pokeweed.

Glabrous trees and shrubs with alternate entire leaves, and racemes of flowers with bract and bracteoles, four or five sepals, no petals, five to twenty-five stamens and five to ten carpels, more or less united, and in fruit fleshy, each with one seed containing a curved embryo.

Species 2 in tropical and sub-tropical regions.

Phytolacca dioica *Linn.* ; v 21, I 2. ; Pokeweed. A coarse shrub with stalked, ovate leaves drooping spikes and fruit of five black fleshy carpels. Fl. N. & P. Hts., Vol. III, t. 581 (reversed). **t. 427.**

A garden escape about Ootacamund and Kodaikanal, native of Paraguay, South America. Also recorded near Calcutta.

POLYGONACEÆ.

Buck-wheat, Rhubarb, Dock, Sorrel, etc.

Herbs with alternate leaves, peculiar in having a thin tubular stipule sheathing the stem (and covering the young leaf-bud). Flowers jointed to the pedicels. Perianth of three to six parts, which persist till the fruit is ripe and may or may not be separable into an outer set (sepals) and an inner (petals). Stamens five to eight, opposite the perianth segments. Ovary superior, angled, with one basal erect ovule, almost peculiar in having the micropyle at the opposite end to the point of attachment. Fruit a nut usually enclosed in the perianth, with floury or bony endosperm.

Genera 30, species 600 chiefly in temperate regions.

KEY TO THE GENERA.

Perianth of female flowers in fruit spiny . . . . EMEX.
Perianth of 3 to 5 parts, stigmas capitate. Flowers white or pink sessile in axil of a bract . . . . POLYGONUM.
Perianth of 6 parts, stigmas fimbriate. Flowers greenish, pedicelled . . . . RUMEX.

POLYGONUM. F.B.I. 119 III.

Knot-grass, Persicaria, etc.

Herbs or undershrubs of various habit, with alternate leaves, swollen nodes, and usually large stipular sheath (ochrea) the mouth of which may be straight or oblique. Flowers small in clusters at the axils and nodes of the inflorescence, in the axils of sheathing or concave bracts.

Perianth segments five, stamens eight. Stigmas three, capitate. Nut bi-convex or three-angled, enclosed in the slightly enlarged, occasionally fleshy, perianth. Embryo more or less to one side of the nut, with narrow cotyledons.

Species 200. Almost all over the world. *Fr.* Renouée. *Ger.* Knöterich.

KEY TO THE SPECIES.

a { Flowers in long or short racemes. Ochrea and bracts tubular and truncate . . . . *b*
Flowers in heads. Mouth of ochrea oblique : bracts flat *d*
Flowers in large loose panicles : stipular tube short . *g*

b { Leaves glabrous : nut bi-convex : bracts tubular . . *c*
Midrib strigose below : nuts usually three-angled . . .
3. P. Hydropiper and 4. P. flacidum.

c { Spikes 2 to 4 inches erect : glabrous plant . . . .
1. P. glabrum.
Spikes ½ to 1 inch ochrea and bracts ciliate . . . .
2. P. minus.

d { Heads sessile in leaf axils . . . . 5. P. punctatum.
Heads few on slender peduncles ; stem with recurved prickles 3
Heads in much-branched terminal panicle . . . .
6. P. chinense.

e { Creeping herb : peduncles paired . . 7. P. sphærocephalum.
Erect herb : leaves deltoid at base . . 8. P. strigosum.
Do. leaves narrowed at base . 9. P. pedunculare.

f { Stems rough with reflexed hairs . . 10. P. rude.
Stems soft with erect or spreading hairs . 11. P. molle.

1. **Polygonum glabrum** *Wild.; F.B.I.* v 34, III 24. A tall herb of watery places with long slender racemes of pink flowers, narrow acuminate leaves, long truncate stipular sheaths and bi-convex nuts. Bracts tubular

usually glabrous. Leaves 4 to 6 inches as a rule but may be much more: gland-dotted; glabrous. Stem often rooting at the nodes. Wt. Ic. 1797.

Shevaroys: Yercaud. Also Northern Circars, Carnatic, Travancore.

2. **P. minus** *Huds.; F.B.I.* v 36, III 29. A much smaller plant in every way than the last, the stems sometimes creeping, the spikes ½ to 1 inch, the leaves about 2 inches, the truncate stipular sheath under ½ inch and distinguished from it also by hairs on the mouth of the stipular sheath, on the midrib of the leaves, and on the bracts. Wt. Ic. 1800 (P. strictum).

Nilgiris and Pulneys: up to 7,000 feet [*F.M.P.*].

Gen. Dist. Hotter parts of India, Ceylon, Kashmir, temperate Asia and Africa.

3. **Polygonum Hydropiper** *Linn., F.B.I.* v 39, III 36. A tall robust herb of watery places, with subsessile lanceolate leaves up to 3 by ¾ inch, glabrous except for hairs on the midrib and ochrea, which may be minutely ciliate at the mouth; and three-angled nuts (styles 3) often glandular. Flower pink.

Western Ghauts up to 6,000 feet [*F.M.P.*].

Gen. Dist. Bengal on the plains and to 5,000 feet northern India to 7,000 feet. Europe and North Africa, Java and North America, Australia.

4. **Polygonum flacidum** *Meissiu.; F.B.I.* v 39, III 37. Racemes very long and slender: bracts fringed or ciliate. Ochrea with fringe of cilia half as long as the tube. Styles 3 and nut triangular. Leaves lanceolate or elliptic-lanceolate, acuminate up to 6 by 1 inch.

Western Ghauts in wet forests up to 6,000 feet. [F.M.C.P. Not seen from this locality.]

Gen. Dist. In wet places throughout India, Ceylon, Malacca, Malay.

5. **Polygonum punctatum** *Buch. Ham.*; formerly P. alatum; *F.B.I.* v 41, III 41. An annual herb. Stems and branches sometimes weak near the base and rooting at the lower nodes, 6 to 18 inches. Stipule $\frac{1}{4}$ to $\frac{1}{3}$ inch, tubular at the base, widening to a very oblique mouth. Leaves ovate deltoid, narrowed to the short clasping stalk. Peduncles slender. Clusters subtended by a small leaf (or large leaf-like bract): bracts of the flowers acute. Nut bi-convex or trigonal. **t. 428.**

Roadside and garden weed. Ootacamund, etc. Kodaikanal. Flowering after the rains.

Gen. Dist. Mountains of India, Ceylon, Afghanistan, Java, Japan, Abyssinia.

6. **Polygonum chinense** *Linn.; F.B.I.* v 44, III 48 Almost shrubby. Stem tall stout, branched, glabrous. Stipular sheath $\frac{3}{4}$ to 1 inch, with long wavy point. Leaves 3 to 5 inches, ovate-oblong, acuminate, finely serrate: stalk $\frac{1}{4}$ to 1 inch, with two ear-like expansions at the base. Ultimate peduncles divaricate, covered with short glandular hairs. Clusters $\frac{1}{4}$ to $\frac{1}{3}$ inch. Flowers usually white with a little pink, also pink or purplish. Nuts variable, in a dry or a fleshy perianth. Wight Ic. t. 1806. **t. 429.**

Very common in the rich cool soil of woods, and as a garden weed.

Gen. Dist. Mountains of India, Burma, Ceylon, Malay islands, China, Japan.

7. **Polygonum sphærocephalum** *Wall.; F.B.I.* v 43, III 44. Stem creeping. Heads on paired glandular peduncles. Ochrea strigose with naked mouth. Leaves about 3 by 2 inches, ovate shortly acuminate with nearly horizontal base.

Nilgiris: Dodabetta.

Gen. Dist. Temperate Himalaya, Nepal, Kumaon.

8. **Polygonum strigosum** *Br.*; *F.B.I.* v 47, III 53. Stem 1 to 3 feet, prickly (much or little), as also are the leaf-stalks, nerves and peduncles, red. Leaves 2 to 4 inches, oblong acute or lanceolate, horizontal or cordate at the base, usually glabrous above, and also below except for the prickles: stalk $\frac{1}{4}$ inch stipular sheath open, oblique. Racemes $\frac{1}{4}$ to $\frac{1}{2}$ inch, on slender peduncles of $\frac{3}{4}$ to 2 inches. Bracts ovate or oblong, fringed with hairs. Stamens 6 to 8. Nut black, three-angled. **t. 430.**

In water and in wet places. Common on these hills, sometimes colouring a marsh red.

Gen. Dist. Mountains of India and across to China.

9. **Polygonum pedunculare** *Wall.*; *F.B.I.* v 48, III 55. Flowers in small heads, on slender bifurcated peduncles. Leaves narrow lanceolate, narrowed to the base, up to 8 inches by $\frac{3}{4}$ inch, shortly stalked. Ochrea about 1 inch but mouth oblique. Stem, midrib of leaf underneath, and petioles harsh with short recurved prickles.

A very variable species, the stems being sometimes nearly smooth (P. pedunculare proper), the leaves very narrow (*var.* angustissimum), the peduncles glandular (*var.* nilagirianum) and altogether a larger plant with large heads (*var.* robustum). These all occur on the Nilgiri and Pulney hill-tops, and one or two at least on the Shevaroys also.

Gen. Dist. India to the Malay Islands, China and Australia.

10. **Polygonum rude** *Meissu.*; *F.B.I.* v 49, III 58. A large shrubby plant with thick zigzag branches, closely covered with downward hairs. Leaves 6 to 9 inches by $1\frac{1}{2}$ to $2\frac{1}{2}$, elliptic acuminate; stalk 1 inch, ochrea truncate but acuminate on one side. Flowers minute in large compound panicles; bracts flat.

A Himalayan plant, found occasionally in Ootacamund gardens.

11. **Polygonum molle** *Don.*; *F.B.I.* v 50, III 59. Very similar to the last but much softer and hairs erect or spreading, not deflexed.

A Himalayan plant like the last ; run wild on the Nilgiris.

FAGOPYRUM. F.B.I. 119 IV.

Buck-wheat.

Similar to POLYGONUM except for the nut being longer than the encircling perianth (which is not enlarged in fruit), and the cotyledons very broad and folded and curled round the radicle.

Species 2, temperate Europe and Asia, cultivated everywhere.

Fagopyrum esculentum *Mœnch* ; *F.B.I.* v 55, IV 1; Common Buck-wheat. Annual. Stem $1\frac{1}{2}$ to 2 feet, glabrous, hollow. Stipular tube about $\frac{1}{8}$ inch, with longer point. Leaf-stalks $1\frac{1}{2}$ inches, blades broadly triangular-cordate ; upper narrower. Flowers nearly sessile, along the branches of terminal cymose corymbs, pink or white. Nut $\frac{1}{4}$ to $\frac{1}{3}$ inch, ovate with acute angles. **t. 431.**

A roadside weed at Ootacamund. Cultivated on the Nilgiris, Himalayas, Khasi Hills, in Thibet and in temperate North America. *Fr.* Ble noir. *Ger.* Buckweizen.

RUMEX. F.B.I. 119 VII.

Dock, Sorrel, etc.

Perennial, rarely annual, herbs with alternate often radical leaves and small flowers in clusters at the axils or nodes of the inflorescence branches ; and characterized chiefly by the perianth being of six parts, three outer and three inner ; the former remaining unchanged, the latter

in fruit enlarged, and one or more often much thickened. Stamens 9. Nut three-angled ; embryo to one side, bent, with narrow linear or oblong cotyledons.

Species 100 all over the world.

Rumex nepalensis *Spreng.*; *F.B.I.* v 60, VII 5. Rootstock covered with dead and dried roots, leaf-bases, etc. Stem erect 2 to 4 feet repeatedly forked. Leaves ovate oblong, acute with abrupt base, finely toothed, nearly glabrous : upper leaves sessile, lower stalked. Flower-clusters in the axils of leaves which become towards the top small bracts. Flower $\frac{1}{8}$ inch. Fruit $\frac{1}{5}$ inch : inner perianth segments fringed with long hooked teeth. **t. 432.**

Roadsides, etc. Pulneys : near Kodaikanal. Nilgiris : Ootacamund.

Gen. Dist. Temperate hills of India, Asia Minor, South Africa, Java.

Rumex acetosella *Linn.*; *F.B.I.* v 61, VII 10 ; Sheep-sorrel. Stems erect, branched from the base or simple, often reddish, slender. Leaves variable, from $\frac{1}{2}$ to 2 inches, stalked, oblong-elliptic, acute, with or without a pair of narrow divergent lobes near the base of the blade : stipules small, silvery. Flower-clusters in slender erect interrupted spikes of 2 to 5 inches in length. Male flower larger than female. Fruiting sepals erect, closely appressed to the small three-gonous nut.

A weed of cultivation, native of the north temperate regions. Pulneys : at Kodaikanal.

EMEX.

Differs from Rumex in its unisexual flowers and very spiny fruit.

Species probably one only, in the Mediterranean, South Africa and Australia.

Emex spinosa *Campbell.* Stem ribbed. Leaves petioled, lanceolate with straight or hastate base, about 1 by ½ inch. Flowers clustered at the forkings of the panicle. Perianth of female flower extended in spines which in fruit may be ⅛ inch long.

Nilgiris : at Coonoor.

PODOSTEMACEÆ.

Submerged plants of rocky streams, in form like a ribbon or sea-weed (" Thallus "), with secondary shoots bearing small leaves and flowers, or in dry weather small stalked capsules. Flowers with 3 perianth parts and 3 stamens, or without perianth but with 2 stamens and sometimes 2 staminodes also. Ovary superior two to three celled, in fruit stalked, with many minute seeds.

An entirely tropical family.

Thallus attached at the base and freely floating above with one-flowered lateral shoots. Capsules ⅛ inch, erect on slender pedicels, long . . . . DICRÆA.

Thallus attached flat to the rock with one-flowered shoots bearing a few small leaves . . . . . HYDROBRYUM.

DICRÆA.

Thallus ribbon-like up to 12 inches. Flowering shoots with a few small leaves usually very narrow. Flowers stalked in the axil of a minute spathe, irregular : an ovary with 2 styles and 2 stamens with 2 staminodes in the axil of a small bract. Wt. Ic. 1916, fig. 2, 3, 4 and 5.

Dicræa dichotoma *Thul.* ; *F.B.I.* v 64 (as Podostemon dichotomus), III 3. Thallus narrow, leaves filiform, stalk of dry capsule about ¾ inch.

Nilgiris : in rocky streams up to 8,000 feet.

HYDROBRYUM.

Thallus attached flat to the rock. Flowering shoots with several small leaves (moss-like). Flowers from the axils of a boat-shaped spathe, with 2 or 1 stamen. Fruit eight to twelve ribbed.

Hydrobryum olivaceum *Tul.; F.B.I.* v 66 (as Podostemon olivaceus) III 8. A very small plant. Pedicels of fruits $\frac{1}{8}$ to $\frac{1}{4}$ inch.

Nilgiris: Pykara river.

PIPERACEÆ.

Herbs or shrubs, sometimes climbing, with entire, often gland-dotted leaves and catkin-like spikes of minute, often unisexual, flowers which have each a bract but no petals or sepals, two to six stamens, and an ovary of one cell. Ovules one or more, erect (the micropyle at the opposite end to the point of attachment). Seed filled mostly with the original tissue of the ovule (*perisperm*), the embryo sac (with its enclosed endosperm) remaining small.

Genera 8, species (?) 1,000, chiefly in America.

Climbing plants with oval leaves, 2 to 4 inches . . . PIPER.
Epiphytes with small leaves $\frac{1}{2}$ to 1 inch. . . . PEPEROMIA.

PIPER.

F.B.I. 124 II.

Pepper, etc.

Thin-stemmed plants climbing up trees to which they attach themselves by roots. Leaves alternate, stalked: those of the climbing stem often of a different size and shape from those of the spreading branches (as happens with many other root-climbers, e.g., the Ivy): nodes usually much swollen. Spikes (or catkins) 1 to 3 inches long, opposite the leaves: mostly unisexual and in the wild

species diœcious. Bract $\frac{1}{30}$ to $\frac{1}{20}$ inch across. Stamens two or three. Ovary with three small stigmas but no style.

The genus is supposed to consist of 400 or 500 species but there has been much confusion in the identification of many of them, for the only certain character, the shape of the bract, is always difficult, and, often in dried specimens impossible, to determine. The leaves vary considerably in shape and hairiness, according to the position on the plant itself and the amount of sunlight they are exposed to. Small and constant variations are also to be found, Dr. C. A. Barber informs me, between the plants of a species in one shola and those of the same species in another: but all of a species in the same shola are usually alike.

Spikes erect . . . . P. brachystachyum.
Spikes pendulous: bracts rounded free at the base . . . . P. Schmidtii.
Spikes pendulous: bracts oblong, attached at the base . . . P. Wightii.

Piper brachystachyum *Wall., Cat.* 6656 *J.D.H. ms.!*; *F.B.I.* v 87, II 24. Peculiar in its very short nearly globular female spikes, and slender erect male ones.

•Leaves on the climbing stem broadly ovate, cordate, cuspidate, about $1\frac{1}{4}$ inches wide, and as long or slightly longer: stalks as long. Leaves of the free branches narrower than long, elliptic, with acute base and bluntly acuminate or cuspidate apex; side veins four. Bracts circular, attached by the centre with margin free all round. Male spikes 1 to 2 inches, slender erect very numerous. Female spikes $\frac{1}{4}$ inch, erect, in fruit $\frac{3}{4}$ inch. **t. 433.** Wight Ic. t. 1931 (Clavica sphærostachya).

Nilgiris: Ootacamund, Lovedale, Kotagiri (abundant in Longwood shola, flowering chiefly in May and June). Pulneys: near Kodaikanal in sholas below the Church Cliff and Pambar House.

Piper Schmidtii *Hook. f.* (*ms. at Kew !*) ; *F.B.I.* v 89, II 30. Stems as thick as the finger. Leaves alternate, each opposed by a spike or the scar of one : stalk $\frac{1}{3}$ to $\frac{3}{4}$ inch, curved always to bring the blade horizontal. Blade ovate-elliptic, often lop-sided ; upper side dark green and glossy ; lower very pale to white ; quite firm or coriaceous. Main veins usually 5 with prominent reticulation between. Male spikes 1 to 3 inches, with stalk of $\frac{1}{2}$ to $\frac{3}{4}$ inch, pendent : bracts circular with free margin : stamens usually two, with thick filaments and anthers opening by vertical cross slits. Female spikes 2 to 3 inches ; in fruit longer, curved more or less and even spirally twisted : bracts square or roundish with rais d margin, free all round. Berries red or yellow. **t. 434.**

Nilgiris : near Ootacamund. Pulneys : near Kodaikanal the common Pepper of these levels.

Piper Wightii *Miq.* ; *F.B.I.* v 94, III 43. Differs from P. Schmidtii in the bracts being oblong, slightly narrowed to the base and decurrent on the stalk of the spike, and more separate, not overlapping. The leaves do not show such prominent reticulation when dry.

Pulneys : Shembaganur woods, etc., below Kodaikanal. Nilgiris : 6,000 feet.

PEPEROMIA. F.B.I. 124 III.

Pepper-elder.

Succulent herbs with alternate opposite or whorled entire exstipulate gland-dotted leaves, and terminal or leaf-opposed spikes of small flowers imbedded in them. Stamens two with confluent anther-cells. Ovary with no style, but a sessile fringed stigma and containing a single

erect ovule. Distinguished from Piper by the minute, not fleshy fruit, the anthers and the distinct stigmas.

Species 400, in hot climates of both Old and New World.

Leaves in fours, $\frac{1}{2}$ to $\frac{3}{4}$ inch succulent . . . . P. reflexa.
Leaves opposite, fleshy . . . . . . P. Wigtiana.
Leaves opposite, thin ; spikes long. . . . P. dindigulensis.

Peperomia reflexa *A. Dietr. ; F.B.I.* v 99, III 10. A small glossy herb common on the branches of trees. Stem weak, rooting at the nodes. Leaves in fours, $\frac{1}{4}$ to $\frac{1}{2}$ inch, ovate, succulent. Spikes terminal, erect, $\frac{1}{2}$ to 1 inch. **t. 435.** Wight Ic. t. 1933.

On trees whenever damp, very common.

Gen. Dist. Himalayas, Khasia, South Indian hills, Burma, China, Australia, Africa, America.

In t. 435, *a* part of spike showing flowers sunk in the hollows ; *b* male flower ; *c* female flower ; *d* fruit.

Peperomia Wightiana *Miq. ; F.B.I.* v 98, III 5. Stem slender, glabrous. Leaves alternate, elliptic-ovate sub-acute five-nerved. Flower spikes slender as long as the leaves, longer in fruit, up to 3 inches erect.

Pulneys : Glen Falls, Kodaikanal, 7,000 feet. Kotagiri.

Gen. Dist. Deccan to Ceylon.

Peperomia dindigulensis *Miq. ; F.B.I.* v 98, III 6. Stems hairy. Leaves opposite, or some alternate, $1\frac{1}{4}$ to 2 inches by $\frac{3}{4}$ inch elliptic rather wedge-shaped at each end. Spikes 3 to 6 inches slender. **t. 436.**

Shevaroys : Green Hills on trees over streams.

LAURACEÆ.

Aromatic shrubs or trees with nearly always alternate and evergreen, scented, exstipulate, simple leaves. Flowers small variously arranged in axillary cymes panicles, or

racemes, or often in clusters surrounded and enclosed in bud by concave bracts. Perianth a tube with usually six lobes, not obviously separable into sepals and petals. Stamens typically twelve, in four whorls of three each, but the innermost whorl sometimes reduced to staminodes; some or all of the filaments with a pair of large yellow excrescences (glands) near the base: anthers oblong, opening not by slits or pores but by lateral holes closed by flaps ("trap-doors") opening upwards. Ovary superior in the base of the perianth tube, with one anatropous ovule suspended from the top, its micropyle upwards. Fruit fleshy or dry, seated often in the cup-like enlarged perianth. Embryo with plano-convex fleshy cotyledons and minute radicle.

KEY TO THE GENERA.

a	Flowers in open panicles	*b*
	Flowers in clusters enclosed in bracts	*d*
b	Leaves 3-ribbed from the base	CINNAMOMUM.
	Leaves penni-veined	*c*
c	Fruiting perianth lobes reflexed. Leaves 8 inches . . .	MACHILUS.
	Fruiting perianth lobes erect. Leaves 3 to 5 inches long.	PHŒBE.
d	Leaves 3-veined	NEOLITSÆA.
	Leaves penni-nerved alternate	LITSÆA.
	Leaves in whorls of 4	ACTINODAPHNE.

CINNAMOMUM. F.B.I. 128 VII.

Cinnamon.

Trees and shrubs with aromatic bark and firm, opposite or alternate, three-nerved leaves. Flowers in axillary or subterminal panicles with short perianth tube and six equal lobes, nine perfect stamens, those of the two outer whorls without glands and with anthers opening

inwards, those of the third whorl with a large yellow gland on each side and extrorse anthers ; and inside these again a fourth whorl of capitate or shortly sagittate staminodes. Ovary sessile, narrowed upwards to the style. Stigma discoid. Berry seated on the enlarged perianth tube.

Species about 54, in tropical and sub-tropical Asia, Japan, tropical Australia.

Cinnamon is now obtained from the bark of C. zeylanica *Nees*, a native of Ceylon. Camphor is obtained from C. camphora, mainly in Formosa.

KEY TO THE SPECIES.

Leaves glabrous, broadly ovate, about 3 inches . C. Wightii.
Leaves glabrous, elliptic 7 to 9 inches . . C. macrocarpum.
Leaves hairy, at least below . . . . C. Perottetii.

Cinnamomum Wightii *Meissn. ; F.B.I.* v 132, VII 15. In the shola, a large tree, with trunk up to $2\frac{1}{2}$ feet thick at 4 feet from the ground. Foliage light green, shiny. Branchlets green, four-angled and grooved, nearly glabrous ; recognizable from above by its shining leaves. Leaves opposite or alternate, strongly three-nerved, very fragrant when crushed : stalk $\frac{1}{2}$ inch : blade broadly elliptic, ovate or obovate, up to 4 by 3 inches, quite glabrous, glacous below. Flowers in open panicles in the upper axils. Peduncle of panicle $1\frac{1}{2}$ inches. Pedicel about $\frac{1}{8}$ inch, thickening gradually to the $\frac{1}{5}$ inch bud, which is thus club-shaped. Sepals three, and petals three, exactly alike, $\frac{1}{8}$ inch, covered outside and in with a fine close silky pubescence. Outer sepal-stamens with thick anther, opening inwards by four small valves ; facing these a set with anthers opening outwards, and at the base of the short filament a pair of round yellow bodies. Petal-stamens like the outer sepal-stamens ; facing them a set of yellow, sagittate staminodes : all more or less pubescent.

Ovary half sunk in the depressed centre, three-angled. Fruit globose on the thickened and enlarged perianth. **t. 437.**

Nilgiris : in sholas common. In Ootacamund, directly opposite Rosemount. Flower in the early part of the year, fruit December. Pulneys : not seen near Kodaikanal but at lower levels.

In place of the fruit there is often a soft body like a small, brown rough-skinned apple, $\frac{1}{2}$ to $1\frac{1}{2}$ inches by $\frac{1}{2}$ inch, flattened on top, on a broadened stalk with a black central mark, $\frac{3}{16}$ inch across. and stylar scar of $\frac{1}{16}$ inch ; this is a gall.

Cinnamomum macrocarpum *Hook. ; F.B.I.* v 133 ; VII 18. Differs from the above by the longer leaves, shorter panicles and large fruit.

Nilgiris : Sispara, at 6,000 feet. (F.M.P.). F.B.I. ' Canara.'

Cinnamomum Perottetii *Meissn. ; F.B.I.* v 134, VII 21. A shrub or small tree, with alternate leaves densely brown tomentose below. Fruit $\frac{1}{2}$ inch.

Nilgiris : sholas near Bangitappal, etc., above 6,000 feet.

MACHILUS. F.B.I. 128 VIII.

Evergreen trees with alternate feather-veined leaves and bi-sexual flowers in axillary panicles. Perianth segments six. Three whorls of stamens perfect, 9 in all ; outer and next whorl without glands and anthers opening inwards ; third whorl with a pair of glands each and anthers opening outwards ; staminodes (of fourth whorl) cordate. Perianth segments in fruit deflexed (difference from next genus).

Species about 15.

Machilus macrantha *Nees. ; F.B.I.* v 140, XIII 13. A large tree, branches brown when dry. Leaves variable, 3 to 9 by $1\frac{1}{2}$ by 2 to $3\frac{1}{2}$ inches, oblong rounded, or elliptic-acute at both ends, glaucous underneath ; veins about 12

pairs raised on both sides ; long-petioled. Panicles subterminal grouped in an open corymb. Pedicels $\frac{1}{3}$ inch. Flower $\frac{1}{4}$ inch, anthers pubescent. Fruit black $\frac{1}{2}$ to $\frac{3}{4}$ inch diameter, black. Wight Ic. t. 1824, 1825.

Nilgiris : on the slopes below Coonoor. Pulneys to 7,000 feet.

Gen. Dist. From the Northern Circars and Vizagapatam to Travancore.

ACTINODAPHNE. F.B.I. 128 XI.

Evergreen shrubs and trees with whorled leaves and small flowers in axillary or lateral, dense, bracteate umbels or clusters. Perianth tube short, segments six. Stamens nine ; outer six without glands, inner three with glands : all anthers facing outwards. Fruit seated on the much enlarged perianth.

Species 50 in eastern Asia and Malaya.

Actinodaphne Bourneæ *Gamble. ; Kew Bull,* 1925, *p.* 128. A small tree ; lateral branches often slender, erect ; all parts tomentose. Leaves in whorls of four or five, densely tomentose on the underside, elliptic lanceolate, penni-nerved. Male flowers clustered ; female umbelled or subracemose on a short stout peduncle. Fruit ellipsoid seated on the much thickened subcampanulate entire perianth tube.

Pulneys : in sholas near Kodaikanal.

Actinodaphne salicina *Meissn. ; F.B.I.* v 148, X 5. Branchlets densely rusty-tomentose. Leaves narrow, 4 to 6 by $\frac{1}{2}$ to $\frac{3}{4}$ inches.

Nilgiris : about Sispara.

LITSÆA. F.B.I. 128 XII.

Trees with alternate leaves and small unisexual flowers clustered in a globose involucre of four or five bracts,

which at length opens. Perianth tubular with usually six lobes. Stamens of male flowers nine or twelve, those of the two inner whorls with glands on the filaments. Fruit a berry seated on, and more or less sunk in, the enlarged perianth (like an acorn in its cup).

Species about 100, in tropical and sub-tropical Asia and Australia.

KEY TO THE SPECIES.

a { Clusters of flowers solitary or fascicled ; berry globose . b
  { Clusters racemed : berry ovoid c

b { Leaves pubescent below, with 10 to 15 pairs of veins : berry ½ inch . . . . L. deccanensis.
  { Leaves glabrous, with 6 to 8 pairs of veins : berry ¼ inch. L. ligustrina.

c { Leaves glabrous, up to 8 inches much longer than broad . . L. Stocksii.
  { Leaves tomentose on nerve beneath, up to 4 inches by 2 inches. L. Wightiana.

Litsæa deccanensis. *Gamble. ; F.B.I.* v. 157 as L. tomentosa *Heyne*, XII 5. Clusters solitary 1 inch across, the bracts young parts and underside of leaves yellowish-tomentose. Leaves glossy above, obovate or oval : veins about 9 pairs. Fruit ½ inch, globose, black.

Shevaroys : lower slopes of Pulneys, etc.

Gen. Dist. Hills of South India 2,000 to 6,000 feet.

Litsæa ligustrina *Nees. ; F.B.I.* v 158, XII 7. A small tree, glabrous or pubescent. Leaves 3 to 4 inches elliptic with very fine reticulations between the pinnate nerves glabrous. Umbels solitary axillary or lateral on peduncles of ½ to ¾ inch. Bract glabrous or pubescent. Flowers usually 5 ; perianth and filament hairy. Berry globose, ¼ inch. **t. 438**. Wight Ic. t. 1835.

On both plateaus—Nilgiris : Coonoor, Wellington Road, Pulneys : Kodaikanal 7,500 feet, and below to Neutral Saddle, 5,500 feet. Flower summer months.

Gen. Dist. On Ghauts from Nilgiris southwards.

Litsæa Stocksii *Hook. f. ; F.B.I.* v 176, XII 56. Tree. Branchlets pubescent. Leaf-stalks $\frac{3}{4}$ inch and veins underneath pubescent otherwise leaf quite glabrous ; blade up to 5 to 8 inches with about 8 pairs of veins. Racemes axillary, 2 to 4 inches. Buds and peduncles $\frac{1}{6}$ inch, brown-tomentose. Pedicels $\frac{1}{6}$ inch with erect silvery hairs. Berry $\frac{1}{2}$ inch ellipsoid.

Nilgiris : on Eastern plateau. Biccapatti, etc., 6,000 feet. Pulneys ; below Kodaikanal. Also Anamalai and Travancore hills.

var. Glabresens *Hook. f.* leaves white beneath.

Nilgiris on western side, Naduvattam, Sispara, Bangitappal valley.

Litsæa Wightiana *Wall., Cat.* 2557 *! ; F.B.I.* v. 177, XII 59. A fair-sized tree. Leaves alternate varying from 2 or 3 inches, usually obovate obtuse, and narrowed to the stalk, to $3\frac{1}{2}$ by 2 inches, very firm and coriaceous, glossy on the upper surface where the nerves are impressed, pubescent and tomentose and, with prominently raised nerves on the under, margin entire, revolute : stalk $\frac{1}{2}$ inch. Raceme of flower-heads 2 inches, rusty-tomentose. Heads peduncled $\frac{1}{5}$ to $\frac{1}{3}$ inch, spherical in bud : bracts four, very concave and firm. Perianth tube $\frac{1}{6}$ inch, narrow egg-shaped : lobes six, silky tomentose. Stamens about twelve, the six outer longer and without glands. Female flowers with similar staminodes. Stigma large and bushy. Fruit oblong, pointed at each end, seated like an acorn on the enlarged perianth. **t. 439.**

In sholas, common on both plateaus.

Gen. Dist. South India.

Considerable variation occurs in the size and shape of the leaves.

var. Tomentosa *Meissn.* Leaves narrow oblong-lanceolate, acuminate, and with more veins, a larger berry and deeper cup. t. 439.

Pulneys: below and about Kodaikanal.

NEOLITSÆA. 128 XII.*

Similar to LITSÆA but differing from that genus as now defined by the leaves being three-nerved at the base, the perianth segments four and stamens six. Fruit seated on the flat or slightly saucer-shaped perianth.

Neolitsæa zeylanica *Merrill; F.B.I.* v 178 as LITSÆA, XII 63; Tallow tree. A small tree, glabrous. Leaves elliptic or elliptic- lanceolate, acute at both ends, prominently three-nerved at the base, but with fainter nerves beyond the middle: lower surface impressed with very fine white reticulation or rounded pits. Buds enclosed in scaly bracts, young leaves silky. Flower-clusters, in bud $\frac{1}{6}$ inch, in dense masses at the leaf-axils. Perianth tube $\frac{1}{8}$ inch, broadening to the lobes, silky. Fruit globose, $\frac{1}{3}$ to $\frac{1}{2}$ inch, seated on a shallow cup $\frac{1}{6}$ inch across. **t. 440.**

Niligiris: on Elk hill near Ootacamund very abundant. Kotagiri, Coonoor and in sholas on the downs. Flowering December. Pulneys common in sholas.

Gen. Dist. Western end of the Himalayas, South India from sea level at Quilon to 7,000 feet, Burma, Malay Peninsula, Ceylon.

A form on the Pulneys has oblong fruits. *Bourne* 399.

PHŒBE.

Trees with alternate penni-nerved leaves and small flowers in axillary panicles near the ends of the branchlets. Sepals and petals 3 each, indistinguishable. Stamens in four circles, the innermost heart-shaped staminodes;

the next with large yellow glands on either side, and anthers opening outwards, the two outer circles normal with anthers opening inwards. Fruit a hard berry seated like an acorn on the enlarged often warty peduncle with one seed inside.

Species 30 ; India and Malaya.

Phœbe Wightii *Meissn. ; F.B.I.* v 142 as part of P. paniculata, I 5. Young parts rusty-tomentose. Leaves 4 to 6 inches by 1½ to 2½ inches, shortly acuminate and cuneate. Lateral veins conspicuous, also the numerous almost parallel veinlets. Peduncles of the small groups of flowers 1 to 1½ inches long, from the upper axils or lateral near the ends of the branchlets. Flowers ⅙ to ¼ inch as above. Berry ovoid ½ inch.

In Sholas at about 6,000 feet, especially on the eastern end of the Nilgiri plateau, Biccapatti, Kodanad ; on the Pulneys below Kodaikanal (Shembaganur valley).

Gen. Dist. Hills of South India generally above 5,000 feet.

F.M.P. has two other species from these hills at 5,000 feet.

P. lanceolata *Nees ;* branchlets, leaves and inflorescence glabrous, peduncles elongating in fruit ; leaves lanceolate acuminate.

P. paniculata *Nees ;* branchlets, leaves beneath and inflorescence minutely grey ; puberous ; peduncles very slender, 3 to 4 inches : leaves oblanceolate long acuminate. Branchlets nearly black.

THYMELEACEÆ.

EUTHYMELEÆ. *Tribe.*

Daphne, Spurge-laurel.

Shrubs or trees with simple entire leaves and clusters, spikes or racemes of flowers, with simple tubular perianth having four or five lobes, and sometimes near the

mouth also scales, two or ten stamens attached at varying heights inside the tube, a superior one-celled ovary and indehiscent fruit.

Genera about 40. Species 360 in temperate and tropical climates.

LASIOSIPHON. F.B.I. 130 VII.

Shrubs with slender twigs, opposite or alternate leaves and dense terminal heads or clusters of silky-woolly flowers, whence the name (*lasios* soft, *siphon* tube).

Species 26, in South Africa, tropical Africa, Madagascar and tropical Asia.

Lasiosiphon eriocephalus *Decaisne ; F.B.I.* v 197, VII 1. Leaves 1 to 3 by $\frac{1}{4}$ to $\frac{3}{4}$ inch, elliptic or oblanceolate acute, nearly sessile, entire, glabrous : midrib prominent ; veins very slender, numerous and much reticulated. Heads of flowers terminal, nearly globular $1\frac{1}{4}$ inches. All parts hairy. Tube of flower $\frac{1}{2}$ to $\frac{3}{4}$ inch, yellow, bent ; lobes $\frac{1}{8}$ by $\frac{1}{20}$ inch, spreading, woolly outside, light brown and nearly glabrous within : scales between the lobes five, much smaller. Anthers $\frac{1}{12}$ inch, opening inwards. Ovary slender, thickened at the middle. **t. 441.** Wight Ic. tt. 1859-60.

In sholas : Nilgiris on the borders of our area, e.g., below Pykara at 6,800 feet, Naduvattam, Coonoor, etc. ; flowering early May, but not near Ootacamund. Pulneys : Poombari, but not at highest levels.

Gen. Dist. South India and Ceylon.

var. Sisparensis. Leaves broader, obovate heads with brown hairs—Sispara ; also Palghaut Hills and Mysore [F.M.P.].

ELÆAGNACEÆ.

A small family of about 15 species nearly all belonging to one genus.

ELÆAGNUS. F.B.I. 131 I.

Trees or shrubs, often straggling, peculiar in being covered all over the twigs and backs of the leaves with numerous flat silvery or brownish shiny scales, attached by their centres. Leaves quite entire, alternate or opposite. Flowers shortly stalked, solitary or in clusters at the leaf-axils, without bracts. Perianth single enclosing the ovary and prolonged above it in a short tube ending in four small deciduous lobes. Stamens four. Ovary one-celled, with one basal erect ovule; style shorter than the perianth tube so that the stigma is enclosed in it. Fruit indehiscent.

Species about 12, in south Europe, temperate and tropical Asia, Australia, North America.

Elæagnus Kologa *Schlecht.*; formerly E. latifolia *Linn.*; *F.B.I.* v 202, I 4. Very variable in habit, from an undershrub of 2 or 3 feet to a straggler climbing up and over tall trees to 60 feet, often with spiny branchlets at right angles to the main branches. Leaves often directed backwards along the branch, ovate-oblong, elliptic or roundish, firm, conspicuously white and shiny on the lower side. Flowers subsessile in clusters of four or five at the leaf-axils. Perianth tube $\frac{1}{4}$ inch: lobes $\frac{1}{20}$ inch, hairy inside. Anthers sessile at the throat. Style half the tube. Fruit linear oblong, $\frac{3}{4}$ to $1\frac{1}{2}$ inches, with eight ribs, red, fleshy with a pleasantly acid taste. **t. 442.**

Very common in all the sholas of both plateaus; flowering winter months.

Gen. Dist. Mountains of India, Ceylon, Burma, Malay Islands, China. In t. 442. *a* flower split and opened flat to show anthers ; *b* immature fruit with flower still attached.

LORANTHACEÆ.

Parasitic evergreen shrubs of 13 genera and 520 species, LORANTHUS and VISCUM being the most important.

The seed is without proper seed-coat and is surrounded by sticky white-milky substance which compels a bird to clean its beak on the branch of a tree and sticks the seed to it. The young plant sends a sucker through the bark into the inner living part of its host. The leaves are usually of a much less clear green than on ordinary plants.

KEY TO THE GENERA.

a { Flowers showy . . . . *b*
{ Flowers small, greenish . . . . *c*

b { A bract but no bracteoles below the calyx . LORANTHUS.
{ Two minute bracteoles as well as a bract on the calyx . ELYTRANTHE.

c { Leafy plants . . . . VISCUM.
{ Leafless plants with jointed stems . . KORTHOSELLA.

LORANTHUS. F.B.I. 132 I.

Evergreen woody plants, parasitic on the branches of trees, with entire, opposite or alternate, thick, yellowish or brownish green leaves. Flowers in cymes or racemes, with small concave or obliquely cup-shaped bract at the base of the calyx, but no bracteoles. Sepals as small teeth or absent : ovary inferior. Petals four to six, united or free, and forming a short or long tube, the free parts (corolla lobes) bent horizontally outwards or recurved. Stamens attached to the base of the lobes, filaments slender ; anthers slender or short. Ovary before fertilization solid, or with a slightly looser tissue in the centre, but with no clearly marked ovule : style single and stigma

undivided. Fruit an egg-shaped berry or drupe crowned by the calyx teeth with very sticky pulp, and a single seed rather to one side, without seed-coat but with a quantity of endosperm and straight embryo, the radicle pointing upwards.

Species above 300, of various habit, in Africa, Asia and Australia, nearly all in tropical regions only.

KEY TO THE SPECIES.

a { Corolla monopetalous, the lobes recurved but tube entire : anthers slender . . . . *c*
Corolla lobes 4, spreading out flat, but free to the base though forming a tube in the lower part, leaves opposite ; flowers in racemes : anthers short . . . . *b*

b { Young parts and flowers glabrous, flower pink. . . . 1. L. intermedius.
Young parts rusty tomentose ; flowers red and yellow 2. L. obtusatus.

c { Flowers in racemes, scarlet, orange or pink. 6. L. longiflorus.
Flowers in fascicles or solitary in the leaf-axils . . . *d*

d { Leaves alternate, cuneate at base. Corolla yellowish opening by a slit nearly to the base . . . . . *e*
Leaves opposite . . . . *g*

e { Flower rusty-tomentose, inflated below the middle: anthers long . . . . *f*
Flower glabrous slender, reddish: leaves 1 inch or less. 5. L. cuneatus.

f { Leaves 3 absurdly veined : calyx tube long. 4. L. recurvus.
Leaves pinnately round ; calyx and teeth short. 3. L. tomentosus.

g { Corolla inflated slightly at the base ; opening first a little below the tip, lobes curling back . 7. L. neelgherrensis.
Corolla slender throughout, red at base and tip, green or yellow in middle, opening from the tip, but one slit extending far down . . . . 8. L. memecylifolius.

1. **Loranthus intermedius** *Wight ; F.B.I.* v 205, I 5, characterized by its opposite leaves and dense spikes of slender erect flowers. Young parts and bracts and flowers rusty, tomentose. Leaves 3 to 4 by 2 to 3 inches, ovate obtuse, very firm, quite glabrous ; obscure nerves : stalks $\frac{1}{2}$ to $\frac{3}{4}$ inch. Spikes on the lower and now leafless parts of the branches in the axils of the fallen leaves, 2 to 4 inches. Pedicel $\frac{1}{8}$ inch frequently deflexed : bract $\frac{1}{20}$ inch : bracteoles absent. Ovary $\frac{1}{10}$ inch. Corolla $\frac{3}{4}$ inch, in bud club-shaped, splitting eventually to the base into four petals, the lower parts remaining together as a tube, the upper spreading out flat, pink ; always standing erect even when the racemes hangs down. Fruit $\frac{1}{4}$ inch.

Nilgiris : at the lower limits of our area. Kotagiri, Naduvattam, Kodanad, Pulneys ; in sholas on the downs.

Gen. Dist. Deccan hills.

2. **Loranthus obtusatus** *Wall. ; F.B.I.* v 205, I 6. Very similar to the last species but young parts and inflorescence tomentose leaves and flowers larger. Tube of corolla scarlet, bulged slightly in the middle before opening, lobes yellow inside and out. Midrib of leaves and axis of racemes red. Racemes more or less erect, and flowers often open downwards. **t. 443.**

Nilgiris : on the western plateau especially on the Kondas, etc. Bangitappal on Rhododendron.

3. **Loranthus tomentosus** *Heyne. ; F.B.I.* v 221, I 27. Distinguished by its short very tomentose brown flowers, in bunches at the leaf-axils ; and conspicuous bract. Leaves alternate obtuse with about three pairs of veins, the lower side rusty tomentose as also on all green parts. Flowers in axillary sessile short stalked fascicles, densely villous. Corolla tube curved, not inflated, split

to the middle, lobes recurved. Filaments short, anthers oblong. Fruit lanceolate $\frac{1}{2}$ inch, on an oblique receptacle. **t. 444.**

Nilgirs : Coonoor and on the eastern plateau at Kodanad, Biccapatti, etc.

Gen. Dist. Wynaad, Coorg and Western Ghauts.

4. **Loranthus recurvus** *Wall. ; F.B.I.* v 213, I 30. Somewhat similar to the last species but leaves three-veined, flowers larger and calyx long. Young parts with grey or buff pubescence. Leaves all alternate, obovate cuneate, drying dark green ; glabrous above, buff-coloured below ; three-nerved at the base. Flowers in numerous axillary tomentose fascicles. Calyx up to $\frac{1}{8}$ inch longer than the bract, irregularly lobed. Corolla inflated curved, yellow ; tube splitting on the dorsal side almost to the base, and spreading wide at the mouth; lobes 5 strongly reflexed. Stamens crimson with linear anthers bent at right angles to the open corolla : style greenish with pink stigma. Fruit $\frac{1}{2}$ inch flask-shaped. **t. 445.** Wt. Ic. t. 305.

The flowers open almost exactly as in L. cuneatus.

5. **Loranthus cuneatus** *Heyne ; F.B.I.* v 214. I 31. Distinguished by its alternate, small, wedge-shaped, erect, often clustered leaves and its slender, curved, yellowish green flowers. Branchlets slender. Leaves $\frac{1}{2}$ to $1\frac{1}{2}$ inches; obovate cuneate, very obtuse, alternate, but frequently in bunches of three or four by development of those of the axillary buds, glabrous, one-nerved, always erect. Flowers two or three together, in bunches at the leaf-axils, on stalks of $\frac{1}{8}$ inch : bract small : no bracteoles. Calyx-tube or ovary, $\frac{1}{12}$ inch. Corolla 1 inch slender, reddish, yellow ; tube splitting to the base and opening out flat, the lobes $\frac{1}{3}$ to $\frac{1}{2}$ inch, slender, reflexed, the lateral

curving back and forward again. Stamens erect, red, continued down the corolla in purple stripes. Anthers linear as long as the lobes, erect. Fruit $\frac{1}{4}$ inch surmounted by small calyx-teeth. **t. 446.**

Nilgiris: abundant near Coonoor, Kotagiri and Kodanad and the eastern plateau generally on Dodonœa viscosa; near Ootacamund. Pulneys: not collected from the downs but at lower levels.

The flowers are visited by a small bird, the "Flower-sucker."

6. **Loranthus longiflorus** *Desr.*; *F.B.I.* v 214, I 35, *var.* amplexifolia. Distinguished by its sessile almost amplexicaul opposite leaves, whitish bark, and racemes of long red flowers with green lobes.

Leaves broadly ovate, cordate at the base, quite glabrous, with 2 or 3 pairs of slender veins starting near the base: midrib and veins sometimes crimson especially near the base. Racemes 1 to 4 inches axillary or terminal; scars of fallen flowers round. Pedicel $\frac{1}{6}$ inch. Calyx teeth absent. Corolla tube 1 inch or more up-curved crimson, slightly broader upwards, to the five green lobes which bend right back on the tube. Anthers orange, style green. Fruit pink. **t. 447.**

Nilgiris: on the Eastern plateau at Kodanad on Ilex Wightiana.

Gen. Dist. The species which varies very much in leaf occurs from the plains to about 6,000 feet.

7. **Loranthus neelgherrensis** *Wight and Arnott*; *Herb. Wight* 26; *F.B.I.* v 216, I 40; Scarlet L. Easily recognized here by the dense bunches of slender crimson-scarlet flowers. Stem as thick as the finger: bark brown with wide-gaping cracks (extra-large lenticels): nodes swollen: youngest branches round, red. Leaves alternate, sub-opposite, or in threes, lanceolate to ovate

entire, quite glabrous, leathery and tough: midrib slightly raised on both sides: nerves obscure. Flowers in crimson scarlet umbels or short corymbose spikes on short peduncles of $\frac{1}{4}$ inch, bunched in the axils of, mostly, fallen leaves. Pedicel $\frac{1}{10}$ inch: bract $\frac{1}{12}$ inch: ovary $\frac{1}{12}$ inch, top-shaped, contracted below the very short entire calyx limb. Corolla 1 inch, scarlet; tube $\frac{1}{3}$ inch, inflated at or below the middle; segments five, twice as long, separating first close above the tube, later curling back and turning an orange colour inside. Style light green with conspicuous red capitate stigmas. **t. 448.** Wight Ic. t. 1020, Sp. Nilg. t. 88.

In the figure: *a* withered corolla slipped off and still held by the style; *b* a full-grown bud; *c* opening bud; *d* fully opened flower; *e* bunch of fruits.

Nilgiris: Ootacamund to Naduvattam, flowering March.

Gen. Dist. Also Ceylon.

8. **Loranthus memecylifolius** *Wight and Arnott; Herb. Wight* 23*!; F.B.I.* v 217, I 41. Branchlets stout. Leaves alternate, thick and firm, oblong or elliptic, obtuse, narrowed to the very short stalk. Flowers three or more, on peduncles of $\frac{1}{8}$ inch, which are again in clusters of one to four at a node. Bract small: bracteoles absent. Corolla 1 to $1\frac{1}{2}$ inches, scarlet and yellowish; lobes slender. Anthers linear, longer than the filaments. **t. 449.**

Nilgiris: near Ootacamund and westwards to Bangitappal on Rhododendron, and Daphiniphyllum. Pulneys: Bear-shola, Kodaikanal; but mostly below our level, at 5,500 feet.

Apparently on these hills only.

The corolla opens at about the middle, the lobes splitting apart later, and the flower turns so as to lie more or less horizontal with the upper part spread out flat and facing upwards. It soon drops off, the anthers rubbing past the stigma as it does so.

ELYTRANTHE.

Parasitic shrubs similar to LORANTHUS, but with two bracteoles to the flower, separate, or combined with the bract into a cup. (Formerly included in Loranthus.)

Elytranthe loniceroides *Engler*, formerly Loranthus lon. *Linn.*; *F.B.I.* v 221, I 54. Distinguished among our species by the large flowers with three equal bracts, rich red reflexed petals, and long exserted stamens. Branches stout with wrinkled corky bark. Leaves opposite. Stalk ½ inch. Blade ovate or elliptic-oblong, usually obtuse. Flowers in cymose groups, on stout peduncles of ¼ inch. Corolla 1 to 2 inches, narrow funnel-shaped, curved, red with blue tip: Segments ½ inch, reflexed, brilliantly red. Anthers slender. **t. 450.**

Nilgiris: near Ootacamund, Governor's shola, etc. Flowers September—December. Pulneys: at lower levels.

Gen. Dist. South India and Ceylon. Previously recorded as reaching 6,000 feet only.

Elytranthe capitellata *Engler* formerly Loranthus cap. *W. & A.*; *F.B.I.* v 221, I 55. Very similar to L. loniceroides. Leaves all opposite, oblong ovate. Flowers in shortly stalked axillary fascicles. Two bracteoles as well as a bract clasping the base of the calyx. Corolla ½ to ¾ inch inflated upwards. Fruit globose; surmounted by the calyx. **t. 451.**

KORTHOSELLA

(*Formerly included in* **VISCUM**).

Leafless parasitic plants, with jointed stems, the joints flattened in one plane. Flowers minute unisexual, mixed with hairs at the joints; the parts in threes. Anthers

united by their margins, and pollen issuing from a central aperture.

Formerly included in Viscum.

Korthasella japonica *Engler*. *F.B.I.* v 226 (Viscum j.). Leafless parasites, with flat jointed branches, the segments obovate, flattened in one plane. Flowers small, sessile, in a fold (or bract) round the axis at each joint, and mixed up with short hairs. Perianth single, of 3 triangular lobes. In the male flowers anthers 3, attached by the margin to the perianth, and opening by a central aperture. In the female flower the style and stigma short and small ; ovary inferior egg-shaped, smooth. **t. 452.**

Nilgiris and Pulneys : *fairly common on* Rhododendron also on other trees.

The flat jointed branches, and numerous yellow egg-shaped (obovoid) young fruits at each joint are very characteristic.

Gen. Dist. Higher mountains of India, Ceylon and Malaya, Mauritius, China, Japan, Australia.

VISCUM. F.B.I. 132 II.

Parasites like LORANTHUS on the trunks and branches of trees, but with forked branches, opposite leaves and very small unisexual flowers usually in very shortly stalked cymes of three, fascicled at the leaf-axils. Perianth single, short of three or four lobes. In the male flowers anthers adnate to the yellowish perianth lobes and opening, not by slits, but by numerous holes. In the female flowers the ovary inferior, style short thick with simple stigma. Fruit a berry crowned by the calyx teeth, with very sticky flesh.

Species 60, in Europe, tropical and sub-tropical Africa and Asia ; some very widely distributed, the common Mistletoe of England, V. *album*, extending from England across Europe and Asia to Japan.

a { Leaves acuminate, obliquely ovate or lanceolate. V. monoicum.
Leaves obtuse at apex . . . . *b*

b { Branches angular : ovary smooth . . V. orbiculatum.
Branches round : ovary warted . . . V. verruculosum.
Upper leaves absent, lower only if any present; berry very small-globose . . . . V. ramosissimum.

Viscum monoicum *Roxb.; F.B.I.* v 224, II 2. Leaves obliquely ovate or lanceolate, 1½ to 2 inches by ½ to 1½ inches, flowers in threes the outer female.

Shevaroys : on the plateau, flower December.

Gen. Dist. Sikkim Himalayas to Tinnevelly.

Viscum orbiculatum *Wt.; F.B.I.* v 224, II 5. Branches four-angled, green often bifurcating. Leaves all opposite, broadly elliptic or rounded, 1 inch or less, entire, slightly three or five-nerved at the base, waved. Flowers in sessile axillary clusters of 3 to 5. Fruit ¼ inch, obovate. Wight. Ic. t. 1016. Sp. Nilg. t. 86.

Nilgiris : on Vaccinum Leschenauttii (*Wight*). Rare.

Viscum verruculosum *W. & A.; F.B.I.* v 224 II 3. Branchlets of upper internodes grooved, flower nearly or quite round, green. Leaves ovate or lanceolate hardly acute; waved or crisped at the margin. Flowers yellowish in small cymes of three, in a broad bract, usually, but not always, all three of one sex. Ovary covered with small warts, lengthening to nearly ½ inch. t. 453.

Nilgiris : on the Eastern plateau near Kodanad on Cinnamomum Wightii; Coonoor.

Gen. Dist. From the Deccan to Tinnevelly and Travancore. Habit much that of the English mistletoe but leaves broader, berries not white.

Viscum ramosissimum *Wall.; F.B.I.* v 225. II 8. Branches many, slender, round. Lower leaves when

present, 1 inch three-ribbed. Outer flowers of cymes usually male. Berry very small, sub-globose may be found at lower levels. It occurs also in Tinnevelly.

SANTALACEÆ.

Sandalwood, etc.

Trees, shrubs or lowly herbs, some parasitic on the roots of other plants, with entire leaves and small greenish inconspicuous flowers, with a bract and two bracteoles. Perianth single of three to six parts. Stamens as many. Ovary inferior, of one cell with two or three ovules attached to a central column.

Species about 200 in tropical and temperate regions, dispersed widely all over the world.

The Sandalwood, *Santalum album* is, economically, the most valuable species. Several of the smaller plants, e.g., species of Thesium, are parasitic on cereal plants, etc., and do some damage.

Small plant 3 to 6 inches, with linear leaves . . THESIUM.
Bush with broad leaves . . . . OSYRIS.

THESIUM. F.B.I. 133 I.

Slender perennial herbs, parasitic on the roots of other plants. Leaves alternate, narrow. Flowers small, greenish. Ovary inferior : perianth continued above it ; lobes five, hairy. Stamens five. Ovules two or three. Fruit a small indehiscent nut, with one seed.

Species about 100, in temperate and tropical regions of the Old World. England has 1 species, the Bastard Toadflax, *Ger.* Vermeinkraut.

Thesium Wightianum *Wall., Cat.* 4037 ! ; *F.B.I.* v 230, I 2. A small herb with slender short or straggling branches springing from a woody rootstock and linear yellowish green leaves, $\frac{1}{2}$ by $\frac{1}{12}$ inch, often curved inwards.

Flowers axillary or terminal, white. Fruit spherical, $\frac{1}{12}$ inch, crowned by the perianth. Wight Ic. t. 1852, ex. anthers. **t. 454.**

On the open downs in grass, common.

Gen. Dist. Nilgiri and Pulney, and Western Ghauts above 6,000 feet.

OSYRIS. F.B.I. 133 IV.

Shrubs with angular branches, alternate leaves and small unisexual flowers. Male flowers with three or four triangular lobes surrounding a thick disc, and four or five stamens. Female flowers with fully inferior ovary, short style, and a three or four-fid stigma. Fruit a globose drupe with globose seed.

Species 6, in south Europe, Africa, and India (one only).

Osyris arborea *Wall. ; F.B.I.* v 232, IV 1 ; plant 8 inches in dry poor soil, to 5 or 6 feet. Branchlets green, angular. Leaves ovate to elliptic-oblanceolate, mucronate, narrowed to the short stalk, yellowish green in colour. Male flowers $\frac{1}{8}$ inch, in axillary peduncled racemes or clusters. Female $\frac{1}{8}$ inch, solitary on axillary peduncles of $\frac{1}{5}$ inch. Fruit a yellow-orange or scarlet coloured berry, $\frac{1}{4}$ inch, showing the small calyx teeth at the top. **t. 455.** Wight Ic. t. 1853.

In sholas and on the downs, common. Nilgiri, Pulneys, Shevaroys, Horsleykonda.

Gen. Dist. Higher mountains of India and Ceylon.

BALANOPHORACEÆ.

A family of fleshy root parasites with scales but not leaves, and unisexual flowers, with simple tubular perianth or often no perianth at all.

Genera 14. Species about 50 in tropical and sub-tropical regions.

BALANOPHORA. F.B.I. 134 I.

Glabrous fleshy herbs, yellowish white or brown in colour with tuberous rootstock warty with numerous lenticels. Flowers massed in dense globular or egg-shaped heads or spadixes, on thick stalks, clothed at the base with large scales. Perianth of male flowers with two to six lobes, and a similar number of stamens. Female flowers without perianth: ovary ellipsoid, one-celled with one ovule. Fruit a nut with crustaceous pericarp adhering to the seed. Seed globular, with copious oily endosperm. Embryo very small.

Species 11 in the Indo-Malayan archipelago, Australia and New Hebrides.

Balanophora indica *Wall., Cat.* 7247 ! ; *F.B.I.* v 237, I 3. Rootstock massive very warty, brown. Peduncle 3 to 6 inches by ½ to 1 inch, with large scales 1½ to 2 by ½ inch at the base. Male spadix 2 to 3 by 1 to 1½ inches, red. Perianth tube ½ inch; lobes ¼ inch, reflexed. Anthers connate into a thick mass ⅕ by $\frac{1}{12}$ inch, and opening by vertical slits. Female flowers minute in a dense round ball.

On the surface of the ground near large trees. Nilgiri and Pulney plateaus, not rare.

Gen. Dist. These hills and Ceylon.

BUXACEÆ.

Shrubs or trees with simple evergreen leaves and unisexual flowers, in which the perianth is simple, the stamens stand opposite its lobes, the ovary is of 2 or 3 cells, with seeds hung by the back—so that the radicle points upwards and inwards—and the fruit is a berry or capsule opening between the partitions.

A very small family, at one time considered a tribe of the next, the EUPHORBIACEA, but differing in the seeds and fruit, in which it is like the SAPINDACEÆ.

SARCOCOCCA. F.B.I. 135 II.

Glabrous shrubs with alternate, stalked, entire, leathery, leaves and short axillary spikes of male and female flowers, each with its bract and four sepals, two inner and two outer. Stamens of the male, as many, opposite the sepals, with thick filaments and oblong anthers which are eventually curved over backwards. Ovary, in the female, as above for the family. Fruit indehiscent. Seeds one or two with fleshy endosperm and broad cotyledons.

Species 2 to 5 in India and Malaya.

Sarcococca trinervia *Wt.* ; formerly S. pruniformis. *Lindl.* ; *F.B.I.* v 266, II 1. A shrub with smooth green branchlets, and dark green three-nerved glossy leaves. Male spike when fully open $\frac{3}{4}$ inch : stamens $\frac{1}{6}$ inch. Female spikes often on older branches, shorter. Fruit $\frac{1}{3}$ inch egg-shaped, surmounted by two small curved stigmas a little to one side of the top. **t. 456.** Wight Ic. t. 1877.

Nilgiris : very common all over the downs to Pykara, and Biccapatti, Pulneys : at slightly lower levels.

Gen. Dist. South Indian hills from Ganjam southwards.

EUPHORBIACEÆ.

Herbs, shrubs or trees with alternate leaves and inconspicuous unisexual flowers (both sexes on the same or on different plants) in which there may or may not be a distinction of petals and sepals, and few or many stamens, but the ovary nearly always of three carpels

and in fruit opening into its constituent carpels each with one or with two seeds. Radicle always pointing upwards and outwards (*raphe ventral*) and more or less surrounded by a fleshy outgrowth (the *aril or caruncle*).

Species 4,000 all over the world but practically confined to the tropics in 220 genera.

KEY TO THE GENERA.

This key is purely artificial, as the genera are separated into tribes by characters not easily seen in the field.

a { Flowers minute, of an ovary or a single stamen only, and massed in egg-shaped involucres . *p.* 526. EUPHORBIA.
Flowers distinct, and with perianth . . . . . . *b.*

b { Erect glabrous shrubs. Flowers solitary or fascicled, their parts in threees . . . . *c.*
Trees . . . . *d.*
Climbing hairy plants . . . . . Appendix (TRAGIA).

c { Fruit dry: perianth not much enlarged . . . . . . *p.* 528. PHYLLANTHUS.
Fruit fleshy: perianth enlarged . . *p.* 530. BREYNIA.

d { Flowers fascicled at the leaf axils. Fruit dry, flat, lobed . *p.* 530. GLOCHIDION.
Flowers in axillary spikes, simple or branched . . *e.*
Flowers in open branched panicles . . . . *f.*

e { Spikes 2 inches very slender the bracts closely imbricated . *p.* 536. EXCŒCARIA.
Spike slender: flowers not close, leaves glabrous . . . *p.* 534. ANTIDESMA.
Spikes thick tomentose. Leaves tomentose . . . . *p.* 534. CROTON.

f { Leaves angular, flowers small . . . . . . ALEURITES.
Leaves ovate, elliptic, or roundish . . . . *g.*

g { Leaves roundish acute, peltate. Capsule $\frac{1}{6}$ inch, green . *p.* 536. MACARANGA.
Leaves entire, three-nerved at base. Capsule red, $\frac{1}{3}$ inch . . *p.* 535. MALLOTUS.
Leaves oval entire. Drupe $\frac{3}{4}$ black . . . DAPHNIPHYLLUM.

h Stinging plants. Calyx much divided in fruit . TRAGIA.

EUPHORBIA. F.B.I. 135 I.

Plants with milky juice and of very varied habit: from small leafy herbs, erect or creeping on the ground, to shrubs with green pencil-like leafless branches, to large succulent, ribbed and angular, spiny leafless plants of cactus-like habit, but clearly distinguished from that family by having simple stout horns, not slender spines intermixed with barbed hairs (as in the Prickly-pear). The apparent flower really a collection of small much reduced unisexual flowers each consisting of one jointed stamen only or one stalked ovary only, without petals or sepals: the former (male flowers) arranged in four or five double zigzag rows radiating from the centre where is the female flower. These all enclosed in a cup-shaped (calyx-like) involucre with four or five oval or crescent-shaped glands, which have often a white petal-like limb: the whole structure forming a unit, in outward appearance like a single flower, and called a *cyathium*. These cyathiums are variously arranged, solitary or in cymes, or bunches. Capsule splitting into three segments each opening to let out the solitary seed.

Species 600 in all except very cold climates. In Europe Spurge, Milkweed. The Cactoid species are mainly developed in South Africa.

Leaves obovate: glands on involucre two-horned . . . . E. helioscopia.
Leaves narrow, oblong; glands oblong . . E. Rothiana.

Euphorbia helioscopia *Linn.; F.B.I.* v 262, I 44; Sun-spurge. Stem usually erect, not branched as a rule below the flowering region. Leaves sessile, obovate cuneate with finely toothed, round end, and very straight sides. Flower branches about five, from the axils of a whorl of leaves: each branch again with three leaves and

axillary rays, and these again forked. Cyathiums $\frac{1}{10}$ inch across: glands semi-circular or kidney-shaped. Capsule $\frac{1}{8}$ inch, its segments with rounded back. Seed acute, ovoid.

A weed, native of Europe, temperate Asia, Afghanistan, Punjab, Japan.

Nilgiris: Ootacamund and the downs to Lovedale, Coonoor, and Pykara.

Euphorbia Rothiana *Spr.; F.B.I.* v 263, I 49. Stem erect or weak at the base, becoming woody. Leaves narrow, erect, oblanceolate obtuse, narrowed to the base, two to four by $\frac{1}{3}$ inch, one-nerved, erect. All upper part of plant sometimes red or crimson. Flowering branches three to five, long or short, bifid once or twice: if long with four or five pairs of bract-leaves, if short with one or two pairs only, and forking at these: these bract-leaves broader and shorter than the usual ones, ovate-triangular, $\frac{3}{4}$ by $\frac{1}{2}$ inch. Cyathiums $\frac{1}{8}$ inch across: glands two-horned. Capsule $\frac{1}{8}$ to $\frac{1}{6}$ inch, quite smooth. Very variable as regards size and shape of leaves and bracts, but remarkable for its numerous narrow erect leaves. **t. 457.** Wight Ic. t. 1864.

In shady, rich or damp soil, on the margins of sholas, etc. Nilgiris: near Ootacamund, Snowdon to Pykara, Devashola, etc. Flowers in June. Pulneys: at lower levels.

Gen. Dist. Hills of Central India, southwards to Ceylon.

BRIDELIA. F.B.I. 135 IV.

Shrubs or trees. Leaves alternate entire, with strong straight venation. Flowers small in simple or spicate clusters, monœcious. Sepals 5. Petals as many smaller. Stamens 5, their filaments united below into a column

which bears a pistillode. Ovary two-celled. Drupe small with 1 or 2 stones.

Species about 30 in tropical Africa, Asia and Australia.

Bridelia Roxburghiana *Gehrm* ; formerly B. retusa *Spreng* var. *F.B.I.* v 268, IV 1. A tree or large shrub, with elliptic and oblong or ovate leaves, 3 to 5 inches long, easily recognized by its 15 to 20 pairs of strong straight veins pinnately arranged along the midrib. Flowers $\frac{1}{6}$ inch in diameter, $\frac{1}{4}$ inch, clusters axillary or in spikes, pubescent or glabrous. Fruit $\frac{1}{4}$ inch, purple black. **t. 458.** Bedd Fl. Syl. t. CCLX.

Nilgiris : Kotagiri, Pulneys : at about 5,000 feet and below. Shevaroys near Yercaud.

Gen. Dist. Throughout hotter parts of the Old World.

PHYLLANTHUS. F.B.I. 135 X.

Herbs or shrubs with entire usually small thin leaves, in two ranks all facing upwards. Flowers of both sexes usually on the same plant, with perianth of five or six parts separable into three sepals and three white and thinner petals. Male flowers with three round glands on the disc and three stamens with their filaments free or more or less united : anthers vertical, opening by slits. Female flowers also with disc glands, and ovary of three cells, each with two ovules with ventral raphe : styles short, free or lightly connected. Fruit a rounded capsule.

Species about 500 in all the temperate and hot regions of both the Old and the New Worlds. Some have edible fruits, e.g., *P. emblica* (Amla, *Fr.* Myrobalam emblic) which is to be found wild or cultivated at slightly lower levels on the Nilgiris.

Phyllanthus Rheedii *Wight, Kew Dist. No.* 2588 ! ; *F.B.I.* v 293, X 21. An undershrub and annual. Stem reddish slender, terete ; branchlets angular. Leaves

elliptic, apiculate, about $\frac{3}{4}$ by 1 inch, thin : stalk $\frac{1}{16}$ inch. Male flowers $\frac{1}{8}$ inch, two or three at a node : pedicels slender, $\frac{1}{16}$ to $\frac{1}{8}$ inch, pendulous : perianth segments with green central streak and white border : anthers 3, at the head of a central column (of united filaments), which as they mature divides into three branches, dehiscing by a vertical slit. Female flowers solitary : pedicel $\frac{1}{8}$ inch, stouter, three-angled. Petals larger than sepals in both male and female flowers. Capsule $\frac{1}{8}$ inch, globose. Seeds with rather distant longitudinal very slender ridges and minute cross-lines. **t. 459.**

Nilgiri and Pulney plateaus, and generally the Western Ghauts.

Phyllanthus Gardnerianus *Baill.* ; formerly as *var.* of P. simplex *F.B.I.* v 295, X 26. Branches long and slender. Leaves 1 to $1\frac{1}{2}$ by $\frac{1}{3}$ to $\frac{1}{2}$ inch, elliptic oblong, sub-sessile, with slightly cordate base, and revolute margin. Pedicels of male flowers $\frac{1}{8}$ inch : of female $\frac{1}{2}$ to 1 inch. Filaments of stamens separate anthers opening at a slant, styles in female flower recurved. Ovary smooth. " Fruit smooth or spiny ; seeds minutely tubercled." **t. 460** (right).

Pulneys : Glen Falls near Kodaikanal. Nilgiris : at 7,000 feet (*Clarke*).

Gen. Dist. Also Ceylon.

Phyllanthus Macræi *Muell.* ; *F.B.I.* v 296, X 27. Differs from the last in its larger leaves, the thick cushion-shaped disc, and erect styles. **t. 460** (left hand figure).

Pulneys : at Kodaikanal.

The stems come up in early summer erect from the root-stock, unbranched : and the oval leaves close upwards at night.

BREYNIA. F.B.I. 135 XXIII.

Shrubs and trees. No petals. Stamens 3, filaments united. Fruit fleshy.

Species about 12 in tropical Asia, Africa and the Pacific Islands.

Fruit orange, on the lobed saucer-like perianth . . . B. patens.
Fruit white : perianth not conspicuous . . B. rhamnoides.

Breynia patens *Benth. ; F.B.I.* v 329, XIII 1. A small shrub with spreading branches, and leaves usually all facing upwards. Flowers at first drooping, in fruit erect. Orange-coloured seated on an enlarged lobed perianth. **t. 461.**

Nilgiris : In light shade or by the road side, Coonoor, Kotagiri and below.

Gen. Dist. Tropical Himalayas to Deccan.

Breynia rhamnoides *Muell. ; F.B.I.* v 330, XIII 4. A shrub with thin ovate leaves about $1\frac{1}{4}$ by 1 inch drying black above and whitish below, quite glabrous. Calyx of female flowers not much enlarged in fruit. Berry white.

Shevaroys : near Yercaud, sometimes grown in Madras gardens.

Gen. Dist. Throughout tropical India to China and the Phillipines.

GLOCHIDION. F.B.I. 135 XI.

Shrubs and trees with alternate quite entire leaves and axillary clusters of small unisexual flowers, the sexes on the same or different plants, with perianth of 4 to 6 lobes or sepals. Stamens of the male flower combined into a central column with erect anthers. Ovary in the female flower of three or more cells, each with two ovules with ventral raphe ; styles short, variously

combined. Neither sex with disc glands (distinction from PHYLLANTHUS). In both of our species the male flowers.

Species 120 in tropical Asia, Malay archipelago and Pacific islands.

KEY TO THE SPECIES.

c { Leaves and branchlets hairy . . . . . G. velutinum.
c { Leaves, etc., glabrous . . . .
b { Styles short thick, truncate . . . . G. neilgherense.
b { Style branched at top, its three parts curving outwards . G. fagifolium.

Glochidion velutinum *Wight ; F.B.I.* v 322 XI 44. A small untidy tree with crooked stem and branches. Young parts, leaves and flowers all densely pubescent or tomentose : twigs round, light coloured. Leaves shortly stalked, oblong or elliptic, obtuse, $1\frac{1}{2}$ by $\frac{3}{4}$ to $2\frac{1}{2}$ by 1 inch, withering red. Male and female flowers clustered together. Pedicel of male $\frac{1}{3}$ to $\frac{1}{2}$ inch, slender : sepals hairy. Pedicel of female stout, very short at first but lengthening with the developing fruit and at length $\frac{1}{3}$ inch : sepals oblong $\frac{1}{12}$ inch : style stout slightly longer, cylindrical, truncate. Capsule depressed-globose, of five to six rounded bilobed segments each with two red seeds. **t. 462.** Wight Ic. t. 1907-2.

Nilgiris : near Ootacamund, Lovedale, Biccapatti. Pulneys : at lower levels, e.g., Shembaganur 5,500 feet. Shevaroys, near Yercaud.

Gen. Dist. The species was founded by Wight on a Nilgiri specimen. Taking a wide view of "species" it may be said to range from Nepal, Sikkim and Khasi hills to Canara and Mysore. But in some of the sheets at Kew the leaves are larger, thinner and less hairy.

Glochidion neilgherense *Wight ; F.B.I.* v 316, XI 27. A small tree with flattish-rounded outline, thick trunk and angular, glabrous, but lenticelled branchlets.

Leaves $2\frac{1}{2}$ to 4 inches elliptic or ovate-lanceolate or oblong, acute or obtusely acuminate, with acute base the sides often slightly unequal, and $\frac{1}{8}$ to $\frac{1}{4}$ inch stalk : veins 9 to 10 pairs. Male and female flowers in the same cluster. Male flowers $\frac{1}{6}$ to $\frac{1}{4}$ inch, broadly funnel-shaped, on slender pedicels (stout in deceased) $\frac{1}{8}$ to $\frac{1}{4}$ inch long : sepals oblong, yellow : anthers 3, surmounted by extensions of the connective half as long. Female flowers sessile : sepals triangular, pinkish, pubescent : style stout, hardly longer than the perianth. Fruiting branches usually bereft of leaves, so that the fruits are mainly on short lateral leafless twigs. Capsule $\frac{1}{3}$ to $\frac{3}{4}$ inch by $\frac{2}{3}$ inch deep, pubescent : surmounted by the now very stout style showing six stigmatic points. Seeds orange or red. **t. 463.**

Nilgiris : by roadsides and in sholas, towards Coonoor, Kotagiri and Kodanad frequent : flowering in May, usually with great abundance and emitting a strong smell of honey from the male flowers, but female flowers not scented. The leafless fruiting branches are very characteristic. Pulneys : below Kodaikanal.

This is the commonest species on the Ootacamund downs. The male flowers are often much enlarged—due to a disease—and then the anthers appear as incumbent on a conical central body (**t. 464**).

Glochidion fagifolium *Miquel ; F.B.I.* v 312, XI 16. Distinguished from the last by the longer subsessile $\frac{1}{6}$ inch female flowers with stylar arms curving outwards, much longer and broader than the perianth. Leaves ovate or elliptic acuminate, slightly unequal at the base, about 4 by 2 inches—larger and broader than in the last species : veins about 6 pairs. Male flowers on slender pedicels, yellow. Fruit $\frac{1}{2}$ inch rather thick.

Nilgiris : in sholas on the downs, near Krummund, etc.

DAPHNIPHYLLUM. F.B.I. 135 XXII.

Trees with alternate entire leathery feather-veined leaves and lax axillary racemes of flowers with three to eight sepals but no petals : the male with large almost sessile anthers ; the female with a two-celled ovary with two ovules in each cell, pendulous with ventral raphe, and ripening to an olive-like drupe with one seed, containing much endosperm. Embryo small with narrow cotyledons.

Species 10 in tropical Asia, and Malay Archipelago, tropical Africa.

Daphniphyllum glaucescens *Blume ; F.B.I.* v 353, XXII 3. Tree with oblong rounded outline, and peculiarly erect leaves with recurved margins, their back showing outwards. Branches striated and rough with numerous broadly heart-shaped leaf-scars and circular bud-scars. Leaf-stalks ½ to 2 inches, pink : blades 2 to 5 by ¾ to 2 inches elliptic, obtuse, acute at the base, with recurved margins, quite glabrous, usually tufted at the ends of the branchlets, erect and showing to the outside the bluey-green undersurface with its very clear network of veins. Flowers in racemes in the axils of the upper leaves. Male pedicel ⅙ inch : perianth small, green : anthers seven to ten, large and red, with small white point, almost sessile on the flat broad disc. Female flowers in longer racemes : pedicel ¼ inch lengthening to 1 inch in fruit : ovary green : styles two, $\frac{1}{10}$ inch long. Fruit ellipsoid, like an olive, ½ to ⅝ inch by ¼ inch, slightly oblique, with very rough skin, and surmounted by the two minute sessile stigmas. Seed one only, with small embryo at the upper end. **t. 465.**

Very common in sholas especially in north-east monsoon areas and occasionally in the open. Nilgiris : round and in

Ootacamund and down to Pykara, Lovedale, Coonoor, Biccapatti, Kotagiri and Kodanad. Pulneys : on the downs above Kodaikanal. Shevaroys : abundant on the "Green Hills." Flower in winter months, fruit in summer.

Gen. Dist. Also Ceylon, Java, Corea.

ANTIDESMA. F.B.I. 135 XXIII.

Trees and shrubs with entire leaves and unisexual flowers in slender, simple or panicled spikes. No petals. Stamens 2 to 5, inflexed in bud. Fruit small.

Species about 70 in tropical Asia, Africa, Australia and Pacific Islands.

Antidesma menasu *Miq.* ; *F.B.I.* v 364, XXIII 25. A small tree. Leaves elliptic oblong, glabrous, 5 to 8 inches by $1\frac{1}{2}$ to $2\frac{1}{4}$ inches. Spikes 4 to 6 inches. Male flower $\frac{1}{12}$ inch in diameter, pedicles $\frac{1}{16}$ inch. Female flowers sessile. Fruit $\frac{1}{6}$ inch ellipsoid acute, with short terminal stigma. **t. 466.**

Nilgiris and Pulneys ; 6,000 feet and below ; Coonoor, Shembaganur, etc. Shevaroys.

CROTON.

Trees or shrubs. Leaves alternate with 2 glands at the base. Flowers solitary or clustered in a terminal raceme with small bracts, monœcious. Male flowers with petals, female without. Stamens numerous free, the anther inflexed in bud. Fruit a capsule.

Species many in all hot countries. The common garden crotons belong really to a slight different genus CODIÆUM.

Croton lacciferus *L.* ; formerly C. aromaticus *H.*, *F.B.I.* v 388, XXXIV 8. An aromatic shrub covered with a yellowish tomentum of star-shaped hairs. Leaves 2 to 4 inches by 1 to 3 inches scabrid on the upper side,

tomentose on the lower, finely and irregularly serrate or nearly entire. Ovary hispid with stellate hairs. Capsule obscurely lobed. **t. 467.** Wight Ic. t. 1915.

Nilgiris : Kotagiri, etc.

The plant may be at once recognized in the summer months by drying leaves of a peculiar salmon-pink colour.

MALLOTUS. F.B.I. 135 LIII.

Trees and shrubs with opposite or alternate leaves. Flowers small without petals, in terminal panicles or spikes. Stamens in the male 20 to 30, filaments, free, anthers globose. Ovary in the female flower of 2 to 4 cells, each with 1 ovule. Fruit a capsule.

Species about 80, in the tropics of the Old World.

Mallotus albus *Muell. var.* occidentalis, *Hook f. ; F.B.I.* v 429, LIII 5. An evergreen tree with young parts densely covered with a rusty or white tomentum. Leaves 3 to 6 inches, ovate, acute, very obtuse almost horizontal at the base, with stalk inserted $\frac{1}{8}$ inch inside the margin : basal veins 3 to 4 pairs, all connected by nearly straight veinlets $\frac{1}{8}$ to $\frac{1}{4}$ inch apart : closely tomentose on lower side. Panicles terminal. Female flowers $\frac{1}{4}$ inch covered with short soft spines which are thickly clothed in dense, white tomentum.

Pulneys at 6,500 feet on road to Perumal below Kodaikanal. Shevaroys.

Gen. Dist. Himalayas to Ceylon and Burma.

Mallotus philippinensis *Muel. ; F.B.I.* v 442, LIII 42. Leaves three-nerved at base, ovate acute base wedge-shaped. All young parts covered with reddish hairs, ovary covered with crimson glands, but not with spines. **t. 468.**

Nilgiris : below Coonoor on the Ghaut Road at 5,000 feet.

Gen. Dist. From Kashmir to Singapore, Ceylon, China and Australia.

MACARANGA. F.B.I. 135 LVI.

Trees and shrubs. Leaves large, with stalk well inserted inside the margin, and glands on the underside. Flowers without petals, in axillary racemes. Stamens in male one or two only. Capsule small, seeds globose.

Species about 80, in the Old World tropics.

Macaranga indica *Wt. ; F.B.I.* v 446, LVI 15. A large tree. Leaves 4 to 8 inches, nearly round, but pointed : basal veins about 10, two of them and the midrib branched : veinlets straight : covered on the underside with rather long stellate hairs. Panicles lateral, 2 to 4 inches. Male flowers in the axils of short branches (of the panicle) which end each in a large ($\frac{1}{6}$ inch) flat open gland ; capsule $\frac{1}{6}$ inch. **t. 469.** Wight Ic. 1883.

Nilgiris : in sholas at 6,000 feet. Lamb's Rock Road, Coonoor, etc.

Gen. Dist. From Sikkim southwards.

EXCŒCARIA. F.B.I. LXXIII.

Glabrous trees with acrid milky juice, and very small unisexual flowers, in very slender spikes the bracts closely imbricated ; male and female on the same or separate spikes. Fruit a three-lobed capsule the cells breaking apart as separate cocci. Seeds globose without caruncle.

Species about 30 in tropical, Asia, Africa and Australia.

Excœcaria crenulata *Wt. ; F.B.I.* v 473, LXXIII 5. A shrub or small tree. Leaves mostly opposite elliptic shallowly crenulate, 3 to 4 by 1 to $1\frac{1}{4}$ inches, dark green. Veins numerous (16 to 20 pairs). Spikes terminal or axillary, 1 to 2 inches, by $\frac{1}{16}$ inch. Sepals, stamens and styles 3 each. Flowers in the axil of minute bracts with 2 small bracteoles. **t. 470.**

Nilgiris: on the borders of our area in drier parts, Coonoor, on the long road up from station, Devashola, Kotagiri, Kodanad.

ULMACEÆ.

Trees with alternate stipulate leaves and small unisexual flowers in cymose clusters or small panicles; perianth of 4 or 5 parts (theoretically in two whorls but not distinguishable as sepals and petals); stamens as many, opposite to them in the male flowers, erect in bud; ovary in the female superior of two carpels (one of which however often aborts) with a pendulous ovary in the cell. Fruit dry or fleshy, one-seeded.

Genera 13, species about 140 in the warmer parts of the world. The commonest genus in Europe is Ulmus the Elm.

Leaves glabrous, nearly as broad as long: flowers $\frac{1}{4}$ inch, few or solitary . . . . CELTIS.
Leaves white underneath: flowers $\frac{1}{8}$ inch, crowded at the leaf-axils . . . . TREMA.

CELTIS. F.B.I. 136 III

Nettle-tree.

Trees and shrubs with deciduous or evergreen leaves, often oblique at the base and small male or bisexual flowers in axillary racemes or solitary (these latter usually fertile), with the characters of the family. Stigmas two, hairy. Pistillode in male flower hairy. Fruit globose or ovoid.

Species about 60 in temperate and tropical regions of the New and Old World. *Fr.* Micocoulier.

Leaves toothed, main veins many . . . . . . C. tetrandra.
Leaves entire, main veins 3 only . . . . C. Wightii.

Celtis tetrandra *Roxb.* ; *F.B.I.* v 482, III 2, including C. australis *L.*, *F.B.I.*, III 1 ; *Wall. Cat.* 369 !. A large tree : branchlets sometimes drooping. Leaves and young parts glabrous or pubescent. Leaf-stalks $\frac{1}{3}$ inch ; blades $2\frac{1}{2}$ to 3 by $1\frac{1}{4}$ to 2 inches, elliptic, shortly acuminate, obtuse, with three nerves at the base and usually one other strong pair from the midrib ; the outer nerves again forked outwards, all rather straight ; margin serrate. Flowers in short axillary racemes or tufts. Fruit spherical, size of a small pea on a slender stalk $\frac{3}{4}$ inch long.

Nilgiris : common in Ootacamund (a fine specimen by the Havelock road just below the Toda mund) and on the downs to Coonoor and below at Karteri.

Gen. Dist. Eastern Himalayas, South India, Burma.

I can see no difference between this and C. australis *L.*, which occurs from Nepal to the north-west Himalayas, and the Salt Range and westwards to Spain.

The venation of the leaf is very characteristic. The leaves droop very markedly at night as if withered : the young foliage flushes pink and yellow, at Ootacamund in October.

Celtis Wightii *Planch.* ; *F.B.I.* v 483, III 4. A tree, with smooth grey bark : branchlets with yellowish brown pubescence. Leaf-stalks $\frac{1}{8}$ inch, glabrous, blades up to 3 or even 6 by $1\frac{1}{2}$ to 3 inches, usually small, elliptic or oblong, acute at both ends, quite entire, glabrous, shiny, green on the upper side, with three strong nerves at the base, the lateral reaching the tip though there faint, crossed by numerous nearly straight veins $\frac{1}{8}$ inch or more apart. Flowers in small pubescent panicles on the leafy shoots below the young leaves : male and female flowers mixed. Bracts and bracteoles soon falling. Sepals $\frac{1}{16}$ inch, pink-tipped. Stamens

slightly longer ; and pressing open the sepals : anthers nearly round. Ovary egg-shaped, $\frac{1}{8}$ inch, with two large stout pubescent styles, which diverge from each of two sides. **t. 471**.

Nilgiris : on the borders of our area about Pykara, Coonoor Kodanad, Biccapatti.

Gen. Dist. Lower slopes of Western Ghauts.

The tree is deciduous, and the young leaves come out with the flowers just before the monsoon rains, at Pykara towards the end of June ; they are terracotta or brownish towards the tips, not the yellow and red of C. tetrandra.

TREMA. F.B.I. 136 IV.

Charcoal-tree.

Shrubs of trees with alternate, serrate, three or five-nerved leaves and long deciduous stipules. Flowers in axillary cymes, differing from CELTIS in the male sepals being folded and valvate in bud, and the cotyledons of the seed narrow.

Species about 20 in the warmer regions of the New and Old Worlds.

Trema orientalis *Blume ; F.B.I.* v 484, IV 3 ; Charcoal tree. A small or large tree. Leaves ovate acute lop-sided, finely serrate almost all round to the rounded or cordate base : nerves joined by numerous cross-veins : upper surface scabrid : lower white with silvery pubescence or tomentum. Drupe $\frac{1}{6}$ inch. **t. 472.**

Nilgiris : at Kotagiri and below very common. Not at Ootacamund. Pulneys : on slopes below Shembaganur only. Shevaroys.

Gen. Dist. Lower hills of India, south of Nepal, Western Ghauts, Ceylon.

MORACEÆ.

Consisting of the tribes moreæ and artocarpeæ formerly included in the family URTICACEÆ.

Flowers small, unisexual on the same (monœcious) or different plants (diœcious), crowded on or inside a receptacle. Perianth of 4 (or 5) parts ; stamens of male flowers as many opposite to them, or fewer ; ovary in the female superior, one-celled with one pendulous ovule. Fruit achenes or drupes.

KEY TO THE SPECIES.

Juice milky, flowers inside the receptacle (fig) . . . FICUS.
Juice not milky, flowers in the flat surface of a receptacle . . DORSTENIA.
Juice not milky, fruits fleshy on a conical receptacle . MORUS.

The Mulberry, Morus alba *L.* and M. nigra *L.*, is frequently planted for its fruit, e.g., at Shembaganur : or in Mysore for feeding silk-worms.

FICUS.

The minute flowers are borne on the inner side of a hollow receptacle, which has an opening at the end further from the stalk, guarded by slender filaments (bracts). Female flowers usually consisting of an ovary with style attached to one side, and a flat stigma only, the flowers often of two kinds one stalked, the others sessile. Male flowers of one or two stamens in a small two to six partite perianth. Trees or shrubs sometimes climbing, with milky juice and alternate leaves with large stipules which form a hood over the bud and leave a scar round the branch when they fall off.

A large tropical genus of perhaps 600 species which however are often difficult to distinguish. Common examples in the plains are the Banyan (F. bengalensis), country Fig. (F. glomerata) and Peepul (F. religiosa). Some species can start

life epiphytically on Palms or other trees, and by the coalescence of the roots may envelop completely their early support. Pollination is effected by small wasps which entering a young receptacle bring pollen to the female flowers, but lay eggs in the stalked ones (rendering them sterile) from which the next generation emerge and pair, and the females flying out carry to another receptacle pollen from the male flowers which are now open.

KEY TO THE SPECIES.

a	Receptacles $\frac{1}{2}$ inch, solitary in the leaf axils	*b*
	Receptacles 1 to 2 inches, in clusters	*c*
b	Leaves ovate, petiole $1\frac{1}{2}$ to 2 inches . . .	F. Tsiela.
	Leaves ovate, petiole $\frac{1}{2}$ inch	F. Benjamina.
	Leaves oblong	F. infectoria.
c	Erect trees. Receptacle 1 inch reddish .	F. glomerata.
	Climbers. Receptacle $1\frac{1}{2}$ to 2 inches	*d*
d	Young parts glabrous	F. macrocarpa.
	Young parts hairy	F. guttata.

Ficus glomerata *Roxb.* ; *F.B.I.* v 535, XVII, 110 ; the country Fig. The fruits borne in clusters, or on short leafless branches, from the main stem, about 1 inch, reddish when ripe. Leaves alternate, entire, ovate, oblong, elliptic or lanceolate, glabrous, 3 to 6 by $1\frac{1}{2}$ to $2\frac{1}{2}$ inches, three-ribbed at the base, with 4 to 8 pairs of other veins.

Kotagiri : perhaps planted.

Gen. Dist. All over India.

Ficus macrocarpa *Wt.* ; *F.B.I.* v 534, XVII 105. Receptacles on short branches or knots on the main stem, about $1\frac{1}{2}$ inches yellow, without bracts below. Leaves broadly ovate, 4 to 7 inches by $2\frac{1}{2}$ to $4\frac{1}{2}$, shortly acuminate, entire, glabrous three to five-ribbed at base with 3 to 4 other pairs of veins. Large climbing plants glabrous in the young parts. **t. 473.**

Coonoor : on Lamb's Rock Road fruiting June. Pulneys : Shola on Church Cliff, Kodaikanal (*Bourne*).

Ficus guttata *Kurz ; F.B.I.* v 534, XVII 105. A climbing tree, similar to F. macrocarpa but the young parts hairy, and undersides of leaves tomentose. Receptacles shortly stalked 2½ inches, speckled red and white. Wt. Ic. t. 1966.

Nilgiris Coonoor. Pulneys : Shembaganur, fruit September.

Ficus Tsiela *Roxb. ; F.B.I.* v 515, XVII, 49. Receptacles solitary in leaf axils, ½ inch or less, purple when ripe, smooth and with 3 minute basal bracts. Leaves ovate, wedge-shaped at base, shortly acuminate, about 4 by 3 inches, main veins 6 to 10 pairs, petiole ½ to 2 inches.

Nilgiris : Kotagiri. Properly belonging to the Deccan, from Kurnool southwards.

Ficus infectoria *Roxb.; F.B.I.* v 515, XVII 50. Receptacles axillary, basal bracts larger than in the last. Leaves elliptic or oblong acuminate, 5 to 6 by 2 inches, entire, glabrous ; veins about 6 pairs. A deciduous tree, all parts glabrous.

Nilgiris : Biccapatti on open hill-sides. Shevaroys : on Shevaroyan (large tree over Temple).

Ficus Benjamina *Linn. ; F.B.I.* v 508, XVII 30. A shady tree with alternate, shortly petioled leaves, ovate acuminate in shape, about 3 by 2 inches, smooth and glossy, and with many veins, is sometimes planted, and occurs near Kotagiri. It has berries ⅓ inch diameter, blood-red when ripe, with 3 bracts below.

DORSTENIA.

Small herb with minute flowers imbedded in the flat angular top of a conical receptacle with bracts round

it. Stamens of male flowers 2. Fruit a minute nut which is shot out when ripe by the pressure of the turgid receptacle.

Species about 50, chiefly in tropical America and Africa.

Dorstenia indica *Wall.; F.B.I.* v 494. Leaves ovate, sharply or sinuate-serrate, or almost entire, 2 to 4 inches. Receptacle, $\frac{1}{2}$ inch diameter with 4 or 5 projecting arms. A small succulent herb of cool shady spots. **t. 474.**

Nilgiris : in sholas on the downs, frequent appearing after the rains. Shevaroys.

URTICACEÆ. F.B.I. 136, *tribe* 7.

Herbs, shrubs or trees with watery juice (not milky) and unisexual flowers as given for the MORACEÆ (p. 540), disposed in open cymes, or aggregated in small involucres : but characterized specially by the stamens being at first bent inwards with reversed anthers, then straightening with a jerk which ejects the pollen, and by the ovule being erect with its micropyle at the opposite end to the hilum.

LAPORTEA. F.B.I. 136 XXVII.

Perennial herbs, shrubs or trees with stinging hairs and alternate mostly broad, toothed, feather-veined leaves, and free or connate deciduous stipules. Flowers in small cymose bunches, arranged on the branches of axillary or terminal panicles. Stamens inflexed in bud. Sepals of female four ; ovary and achene oblique flattened.

Species about 25, in Asia, Australia, Africa and a few in North America.

Laportea terminalis *Wight ; F.B.I.* v 549, XXVII 1.

Branches, leaf-stalks and leaves armed with lightly stinging hairs. Leaf-stalks 4 to 6 inches ; blades 4 to 8 inches, by $3\frac{1}{2}$ to 5 inches, broadly-ovate, bluntly acuminate, toothed all round to the base. Male panicles axillary, female subterminal long peduncled. Achenes slightly tubercled, on a winged pedicel. **t. 475.** Wight Ic. t. 1972.

In waste places and by the sides of and in light sholas. Nilgiris : Ootacamund, Kotagiri, Kodanad and Avalanche. Pulneys : Kodaikanal and on the downs. Flowers from June.

Gen. Dist. Sub-tropical Himalayas, South India, Ceylon.

GIRARDINIA.

Stout herbs or shrubs. Leaves alternate, covered with long stinging hairs. Flowers clustered. Female perianth tubular, male perianth of 4 to 5 parts ; stamens as many, inflexed in bud. Fruit a broad acheme.

Species under 10 in tropical Asia and Africa.

Girardinia heterophylla *Dcne. ; F.B.I.* v 550, XXIX. Leaves three-ribbed at base, 4 to 8 inches across, palmately deeply divided, the lobes again very coarsely cut in large triangular teeth. Stinging hairs formidable.

Nilgiris and Pulneys : in sholas on the downs, Coonoor.

PILEA. F.B.I. 136 XXIX

Annual or perennial herbs without stinging hairs. Leaves opposite, three-nerved. Flowers in heads or lax cymose panicles. Sepals of the male flower concave, fleshy, often with an appendage or horn, on the back.

Stamens 2 to 4. Sepals of the female three, unequal the dorsal one longest and often hooded or swollen on the back, with scales (staminodes) opposite them.

Species about 16 in Asia, Africa and tropical America. *Ger.* Kanonierblume.

KEY TO THE SPECIES.

a { Stipules persistent, 1 inch by $\frac{1}{4}$ . . . P. stipulosa.
Stipules caducous or small . . . . *b*

b { Leaf 1 to 2 inches without acumen, coarsely toothed to the apex. . . . . P. Wightii.
Leaf 3 to 6 inches : serrations $\frac{1}{20}$ deep, $\frac{1}{4}$ to $\frac{1}{2}$ apart to apex. P. trinervia.
Leaf 2 to 5 inches : teeth $\frac{1}{8}$ to $\frac{1}{4}$ inch deep and wide, acumen $\frac{1}{2}$ inch narrow . . . . P. Kingii.

Pilea Wightii *Wedd.* ; *F.B.I.* v 554, XXIX 10. Stem about a foot, weak and rooting at the lower nodes, quite glabrous. Leaves $1\frac{1}{4}$ to $2\frac{1}{2}$ by 1 to $1\frac{1}{4}$ inches, ovate or rounded, coarsely toothed or serrate, acute or hardly acuminate, three-nerved : stipules short or absent. No cystoliths. Flowers small, clustered along the loose branches of an open cymose panicle. Achenes smooth, $\frac{1}{20}$ inch. **t. 476.**

Nilgiris : in shady places on the downs, e.g., in plantation near Forester's hut, Krurmund road ; Pykara. Pulneys : Gundattu shola above Kodaikanal.

Gen. Dist. Temperate Himalayas, Sikkim, South Indian mountains, Ceylon, Java.

Pilea stipulosa *Miquel.* ; *F.B.I.* v 555, XXIX 11. A tall herb distinguished by its very large oblong stipules. Leaves long-stalked, 3 to 5 by $1\frac{1}{2}$ to 2 inches, elliptic, shortly acuminate, serrate, three-nerved at the base : stipules 1 to $1\frac{1}{2}$ by $\frac{1}{4}$ to $\frac{1}{3}$ inch. Cystolith numerous, small,

Flowers crowded in shortly-stalked, close cymose panicles, which are fascicled, two or three in a leaf-axil. Achenes minute smooth.

Pulneys : Gundattu shola, Kukal.

Gen. Dist. Ceylon (where the species was founded).

Pilea trinervia *Wight. Herb. Prop.! ; F.B.I.* v 557, XXIX 16. Stem robust, glabrous, succulent internodes swollen but contracted when dry. Leaves 3 to 6 by 1½ to 3 inches, oblong lanceolate to broadly-elliptic, acuminate, shallowly serrate. Outer pair of basal nerves connected to the midrib by numerous straight or slightly curved veins, and branching also to each tooth. Cystoliths numerous, small. Panicles axillary ½ to 2 inches, much branched. **t. 477.** Wight Ic. t. 1973.

In cool shady places, woods, etc., common. Shevaroy plants have the acumen drawn out over an inch and very slender.

Gen. Dist. South India and Ceylon.

Pilea Kingii *Fischer. ; Kew Bull.* 1927, *p.* 76. Leaves lanceolate (to roundish) narrowed to the acuminate point, sharply and coarsely serrate ; glabrous above, pubescent on the veins below. Cystoliths numerous, small. Nuts circular bi-convex, smooth.

Dodabetta : in cinchona plantations.

Pilea sp. ? Similar to P. trinervia but stem shrubby, not flat on drying. Leaves 3 to 5 by 1 to 1½ inches, lanceolate, narrowed gradually to the slender apex, slightly curved, teeth ⅛ inch by $\frac{1}{16}$ inch. Lateral veins extending into the tip. No cystoliths.

Pulneys : Kodaikanal shola, *Fyson* 2113.

LECANTHUS. F.B.I. 136 XXX.

Small delicate herbs with opposite leaves, differing in size, and stalked receptacles bearing the minute unisexual flowers. Sepals of male flowers 4 (or 5) with a stamen opposite each, of the female 3. Differs from ELATOSTEMA in the receptacles being stalked.

Lecanthus Wightii *Wedd.* ; *F.B.I.* v 5590 XXX 1. Stem 2 to 6 inches. Leaves $\frac{1}{2}$ to 1 inch, ovate serrate, glabrous. Receptacles $\frac{1}{10}$ to $\frac{1}{2}$ inch diameter on peduncles of $\frac{1}{2}$ to 6 inches. At lower levels it grows much larger.

Nilgiris : Ootacamund, Naduvattam and below. Pulneys : Poombari valley (*Bourne*).

Gen. Dist. Central Himalayas and southwards to Ceylon, Java and Tropical Africa.

ELATOSTEMA. F.B.I. 136 XXXII.

Annual or perennial herbs, with alternate, very unsymmetric, coarsely toothed leaves, and characterized further by the flowers being aggregated in dense axillary cushions (receptacles), which are at first enclosed in an involucre of bracts, and in fruit become flat. Bracteoles to each flower two : sepals of the male very thin : sepals of the female small and narrow.

Herbs of damp shady places.

KEY TO THE SPECIES.

a	Leaves in very unequal pairs	E. surculosum.
	Leaves all of one size	*b*
b	Leaves with visible, cystoliths	*c*
	Leaves quite smooth : coarsely crenate .	E. acuminatum.
c	Leaf coarsely toothed from apex to base . .	E. sessile.
	Leaf with long point, and a few shallow teeth.	E. lineolatum.

Elatostema sessile *Forst ; F.B.I.* v 563, XXXII 2. Stem slender, flexuous, 1 to 2 feet. Leaves 4 by 2 to 5 by $2\frac{1}{2}$ inches, coarsely serrate from apex to base, when dry, roughened on the upper side by numerous cystoliths. Receptacle $\frac{1}{4}$ to $\frac{1}{3}$ inch ; in fruit $\frac{1}{6}$ to $\frac{1}{4}$ inch, with numerous achenes imbedded in it : bracts with dorsal spurs ; bracteoles minute. In woods, etc. **t. 478.** Wight Ic. t. 1983.

Nilgiris : In sholas on the downs, Ootacamund to Naduvattam. Pulneys : above Kodaikanal and down to 5,000 feet.

Two varieties occur here.

* *var.* **cuspidata** *Wight, Herb. Prop* ! Leaves glabrous on the upper side.

** *var.* **pubescens**. Leaves hairy.

Gen. Dist. Temperate and tropical Himalayas from Chamba eastwards, Assam, Sylhet, Khasia, Japan, Malay, Pacific islands and tropical Africa.

In t. 478 : *a* underside of receptacle showing bracts with dorsal spur ; *b* female receptacle from above ; *c* male receptacle ; *d* female flower with bracteole ; *e* stalked female flowers mixed with the others [*E.T.B.*].

I do not find the female receptacle without bracts as given in F.B.I.

Elatostema lineolatum *Wight ; F.B.I.* v 565, XXXII 6. Stem slender. Leaves narrow with long (up to $1\frac{1}{2}$ inches), acumen and three or four shallow teeth in the further half only, the basal half being cuneate entire variable in shape and size. Male receptacle $\frac{1}{8}$ to $\frac{1}{4}$ inch, embraced by a number of rounded bracts. Flower embraced at first by two very boat-shaped semicircular bracteoles. **t. 479.** Wight Ic. tt. 1984, 2091 f. 1.

Nilgiris : at Naduvattam. Not collected near Ootacamund. Pulneys : in sholas below Kodaikanal and perhaps also near Kodaikanal.

Gen. Dist. Tropical Himalayas, Khasia, South India, Ceylon.

Elatostema surculosum *Wight; F.B.I.* v 572, XXXII 27. Leaves similar to those of E. lineolatum, but the apex not at all acuminate, and each with opposite it a very small leaf, which is often deflexed. Female receptacle small. Male receptacle sessile. Bracts larger, long-horned. Flowers when open exserted on $\frac{1}{8}$ inch pedicels. **t. 480.** Wight Ic. t. 2091 f. 4.

Pulneys : in sholas.

Gen. Dist. Temperate Himalayas from Simla to Sikkim, Khasia Naga hills, Nilgiris, Ceylon.

Elatostema acuminatum *Brongn.; F.B.I.* v 566, XXXII 9. Leaves without cystoliths, perfectly smooth. Stem shrubby with diverging branches, glabrous. Leaves 2 to 6 inches, obliquely elliptic, acuminate, coarsely crenate for one-third of the inner and about two-thirds of the outer (more convex) side: acumen an inch or more beyond the last tooth : base wedge-shaped : petiole $\frac{1}{12}$ inch. Flower clusters small (about $\frac{1}{8}$ inch).

Nilgiris : in gorge opposite Bangitappal forest bungalow.

The F.M.P. reports only from lower levels (4,000 feet) and "rare." My specimens collected in the Bangitappal gorge, agrees perfectly with that in the Madras Herbarium identified by Mr. Fischer for the F.M.P.

Gen. Dist. Khasi mountains to Tennasserim, Perak and Ceylon.

CHAMABAINA.

Diffuse herbs very similar in appearance to DROGUETIA (t. 483) but the male flowers with four stamens, the cluster in the axils of two large bracts not in an involucre, and ovary with short style.

Chamabaina cuspidata *Wt.; F.B.I.* v 580, XXXVI 1. Male flowers pedicelled, sepals 4, stamens 4, opposite them, a rudimentary pistil in centre. Female flowers

in dense clusters : bracts $\frac{1}{8}$ inch cuspidate and two bracteoles : ovary with excessively short style.

Nilgiris : in moist woods on the western borders of our area at 6,000 feet, Naduvattam, flower August.

POUZOLZIA. F.B.I. 136 XXX VI.

Herbs or small woody plants characterized by the leaves opposite or in threes, with three main nerves of which the lateral do not reach the leaf-tip, and flowers pedicelled in axillary bunches. Male sepals four or five, rounded or inflexed so that the bud is flat-topped. Female perianth small flask-shaped with contracted mouth, from which projects the long deciduous stigma.

Species 35, in the tropics of the Old World.

KEY TO THE SPECIES.

a { Leaves with three nerves only . . . . *b*
Basal nerves branched and nerves therefore numerous : P. Cymosa.

b { Upper leaves distinctly smaller than the lower : sepals four. P. Wightii.
Upper leaves hardly if at all smaller : sepals five . . . . P. Bennettiana.

Pouzolzia cymosa *Wight* ; formerly P. auriculata *Wt. var.* cymosa, *F.B.I.* v 582, XXXVI 5. A straggling long-stemmed plant. Leaves opposite $\frac{1}{2}$ to 3 inches, on a $\frac{1}{4}$ inch stalk, broadly or narrowly ovate or ovate-acute or acute : nerves three at the base and two others from the midrib, all forking so that there may be eleven altogether. Flowers in spreading cymes. Male buds rounded. Wight Ic. t. 1979 f. 2.

Nilgiris : Ootacamund, flowering May to September, Coonoor. Shevaroys : flower January.

P. auriculata *Wt.* separated in F.M.P. as a distinct species, has alternate leaves and occurs at lower levels.

Pouzolzia Wightii *Benn ; F.B.I.* v 584, XXXVI 7. Stem 2 to 3 feet. Leaves subsessile lanceolate with rounded base : lower 3 to 4 inches ; upper slightly smaller and becoming smaller upwards gradually, those near the top of the flowering region ¼ inch only and in proportion broader. **t. 481.**

In cool shady places : several varieties occur.

* *var* nilghirensis *Hook f. ; F.B.I.* v. 584, Wt. Ic. 2096 f 24, 2097 f 25 and 26. Leaves tomentose below but smooth above. Male sepals hirsute above the bend.

** *var.* scabra *Fischer ;* P. scabra Wt. Ic. 2097 f 29, 2095 f 18, scabrid on upper side of leaves. Lower leaves broader.

Pulneys : near Kodaikanal towards Vilpatti : and at lower levels.

*** Lawsoniana. Stem terete, glabrous, male sepals glabrous. Nilgiris : Naduvattam. Shevaroys.

Pouzolzia Bennettiana *Wight, Herb. Wight Prop ! ; F.B.I.* v 585, XXXVI 10. A shrub growing in the open on banks with leaves of the flowering part as large as the lower, and dense axillary bunches of small red flowers. Stem at the base as thick as the little finger, 4 to 5 feet high, with long-spreading decussate branches, red or brownish in colour, and smooth except for a few large lenticels. Leafy branches more or less pubescent, with short erect hairs : almost hirsute in some forms. Stipules ½ inch, brown, scarious. Leaves opposite or in threes, lanceolate, acuminate, three-nerved, with numerous horizontal connecting veins. Flowers in bunches at the nodes, reddish, campanulate or hemispheric, $\frac{1}{12}$ inch ; in bud flat-topped. Male sepals 5, inflexed. Female flowers minute, ripening before the male flowers and therefore mostly to be found in the upper axils. Sepals 5, scarious, tips not inflexed : style ⅛ inch, hairy like a

cat's tail. Fruit $\frac{1}{8}$ inch, nearly circular, flat or flattened on one side with low wing in the middle: but inside dark green, pointed. Very variable in respect of hairiness. **t. 482.** Wight Ic. t. 1978.

Pulneys: in sholas on the downs. Flower September. Nilgiris: on the Eastern plateau. Biccapatti, flower May.

*** caudata. Stem slender glabrous. Leaves up to 6 inches, glabrous. Spikes pubescent, bracts becoming very small, cordate.

DROGUETIA. F.B.I. 136 XLV.

Slender herbs with opposite or alternate three-nerved toothed leaves, without stinging hairs. Flowers of the restricted URTICACEÆ (p. 543) but much reduced and collected into scabrid calyx-like involucres: the male flowers with a small three- to five-lobed perianth and a single stamen inflexed in bud, and the female flower with no perianth but only an ovary and long straight stigma: usually arranged with a female flower in the middle of the involucre with four or more male flowers round it.

Species 4 in India and Africa.

Droguetia diffusa *Wedd.; F.B.I.* v 593, XLV 1. Stem slender diffuse hairy, with long internodes. Leaves stalked, $\frac{3}{4}$ to $1\frac{1}{2}$ by $\frac{1}{2}$ to 1 inch, ovate, coarsely crenate-serrate, with a few scattered hairs on the upper side and on the nerves of the under. Involucres, one to four at a leaf-axil, salver-shaped, with short stalk and lobed bowl, silky: bract very silky. Flowers very small, one female and one to three males: the perianths of the latter closely attached together and coalescing into one rather fleshy mass. **t. 483.** Wight Ic. t. 1982.

In woods. Pulney downs and below. Nilgiris: flower September.

The number and arrangement of the involucres varies considerably in the same plant and even in adjoining leaf-axils, as also does the number of flowers to the involucres of the same axil. I have found six to each of two opposite leaf-axils, making twelve at a node, two of these with three males and one female flower, four with one female flower only. An involucre of three or four male flowers may easily be mistaken for a normal flower with three or four stamens unless the flask-shaped perianth to each stamen is noted.

In. t. 483 : *a* a four-toothed involucre with bract, behind, and in it three male and one female flower ; *b* plan.

CUPULIFERÆ.

QUERCUS. F.B.I. 140 III.

Oak.

Trees with alternate toothed or lobed leaves, and small unisexual flowers. Male flowers in erect or pendulous spikes, with four to seven perianth lobes and many stamens. Female flowers enclosed at first by imbricating bracts, which enlarge as the fruit grows and become a cup with the nut (*acorn*) seated in it.

Species about 300, mostly of north temperate regions and specially in North America.

[3] **Quercus Ilex** *Linn. ; F.B.I.* v 602, III 4 ; the Holm-, Holly-, or Evergreen Oak. Leaves nearly entire, thick, leathery.

Planted at Kodaikanal.

SALICACEÆ.

A family of two genera SALIX Willow, and POPULUS Poplar, Aspen.

SALIX. F.B.I. 141 I.

Deciduous trees with alternate three-to five-nerved stipulate leaves and catkins (pendulous spikees of small flowers. Each flower in the axil of a bract, without sepals

or petals, but with glands or a disc, two stamens, and a one-celled ovary containing few or many ovules on two or four placentas. Fruit an egg-shaped capsule with few or many seeds with long silky tuft of hairs. Embryo with plano-convex cotyledons and short radicle pointing downwards : endosperm.

Species 200 chiefly in north temperate zone.

Salix tetrasperma *Roxb.* ; *F.B.I.* v 626, I 1. A large well-branched tree with slender twigs. Leaves 2 to 3 by 1½ to 2 inches, ovate-acute, serrate, glabrous but bluish underneath, glossy above : stalk ¼ inch. Male catkins 2 to 4 inches in leafy branches, bracts broad ovate, hairy. Female catkins 3 to 5 inches, with smaller bracts. Capsule ⅛ to ⅙ inch, very variable : seeds four to six.

Nilgiris : Ootacamund on the bund at the head of the lake, and to Pykara and Kotagiri (Bazaar stream). Pulneys : Poombari valley, not near Kodaikanal.

Gen. Dist. Mountains of tropical and sub-tropical India from the Punjab to Travancore and Singapore, not Ceylon.

GNETUM.

Gnetum scandens. A strong climber with opposite leaves and branches, and prominently swollen nodes. Male flowers consisting of a large number of stamens between circular cup-like bracts, 6 to 10 such cups forming a cone ¾ to 1 inch long. Female flowers of about six egg-shaped ovules set in similar cup-bracts, but these bracts separated by ¼ to ⅓ inch and forming a spike 3 to 5 inches long. Fruit 1¼ inches, ellipsoid acute, black with finely wrinkled skin, hard. **t. 484.**

Nilgiris : Kotagiri, in deep valleys.

This genus belongs to the GYMNOSPERMS, plants in which the seeds are born on or between scales, not in a closed ovary. Familiar Gymnosperms are the Pine, Cypress and Fir.

In the plate the section of the young female flower shows the flask-shaped perianth, inside this two integuments (united at the base) the inner of which is extended upwards as a very fine tube projecting from the mouth of the perianth. This receives the pollen. The central body corresponds to the *contents* of a seed. It is not an ovule for the term ovule includes the integuments.

MONOCOTYLEDONS.

The families which follow differ from the preceding in having but one first leaf (cotyledon) to the germinating embryo. They are mostly herbs with bulbs or tubers, and fibrous (not tap) roots. Woody plants are the exception. The leaves are simple and have numerous veins. There is usually no definite separation of leaf-stalk and blade. The inflorescence, or the individual flower, is usually enclosed when young in a large bract. The floral parts are typically in threes, but in some families (e.g., orchids) great modifications occur. In the sedges and grasses practically all trace of sepals and petals is lost.

BURMANNIACEÆ.

A small family of about 50 species in the tropics of the Old World, China, and North America.

BURMANNIA. F.B.I. 147 I.

Small very slender annual herbs with radical sword-shaped leaves, or mere scales, and few or solitary flowers remarkable for the three broad coloured wings of the calyx tube. Sepals and petals minute. Anthers three, sessile on the perianth, the two lobes separated by a broad connective and opening transversely. Ovary inferior three-celled. Fruit a three-celled capsule with many seeds.

Species about 20, in all tropical countries from North America to China. Some grow in dry sandy places, others only in water. These latter have slender yellowish or brownish stems and small scales instead of leaves, obtaining their organic nourishment, as saprophytes, from the water.

Burmannia cœlestis *Don.* formerly B. candida *Griffith ; F.B.I.* v. 665, I 5. Stem slender, colourless, 4 to 8 inches high. Leaves reduced to scales $\frac{1}{8}$ to $\frac{1}{5}$ inch long. Flowers white, solitary or in twos. Ovary with its wings $\frac{1}{4}$ to $\frac{1}{2}$ inch long, round or obcordate in outline ; wings $\frac{1}{8}$ inch wide spirally twisted. Perianth very small, outer lobes $\frac{1}{16}$ inch, inner half as long and wide. **t. 485.**

In damp spots, often with Utricularia. Pulneys : below Kodaikanal on Church Cliff ; flowering June. Not common. Shevaroys : at the foot of wet rocks on Sanyasi Hill, etc.

Gen. Dist. Mahendragiri, Western Ghauts, Burma, Khasia, Bengal.

ORCHIDACEÆ.

The Orchid-flower differs profoundly from all others, for there are no separate stamens and style, but only one central column, on the top or at the side of which lies a solitary anther, and on its front face a stigma.

(In the small group of Slipper-orchids, CYPRIPEDIUM, which do not grow here, the structure is a little different, there being two anthers, one on either side of the column.)

The ovary is inferior and long, taking the place of the pedicel which is as a rule absent. There are three sepals and three petals, as is usual with monocotyledons, but one of the petals is very different in shape from the others, and generally has a bag-like depression at the upper end, called a " sac " if it is shallow (tt. 508, 528), or a ' spur ' if it is long (tt. 504, 507, 519).

This petal, known always as the lip or the labellum, is really the uppermost or dorsal one and in a few orchids, e.g., SATYRIUM (p. 595) stands up at the back of the flower, but in most cases is brought by a twisting of the ovary to the lower side and hangs down there. It is not usually difficult to make this out by the twisting of the lines in the ovary (t. 511).

For the explanation of the structure of the column reference must be made to Darwin's British and Foreign Orchids or to any good text-book; it must suffice here to say that, assuming the flower to be derived from the usual monocotyledonous type of five whorls of three each, i.e., three sepals, three petals, three outer stamens, three inner stamens and a three-celled ovary, the column is considered to be made up of one stamen of the outer whorl and three styles two of whose stigmas, fused into one, form the sticky hollow on its face. The other five stamens are all aborted, unless perhaps two of them are part of the column, e.g., when that is winged, and two more part of the labellum when it has lateral lobes. The pollen of each half anther is always aggregated into one, two or four waxy masses termed polliniums.

The disposition of the two halves of the anther differs in different orchids. In HABENARIA and its allies—such as the large white Elephant's Head or Snowdrop orchid, the Purple-ground orchid, the Sweet-Scented Pink Twin-spur, and the Butterfly, Pyramid and Marsh orchids of England,—the two halves, though close together at the top are separated at their bases and attached to either side of the column. They open separately by longitudinal slits to let out the polliniums. But in most orchids, as ÆRIDES the Pink Rock orchid, and CŒLOGYNE the Banana orchid, the two halves of the anther lie together on top of the column and open by a cap which comes off as a whole exposing the polliniums. On some of these orchids, e.g., ÆRIDES, the anther-cap simply falls off at the lightest touch, in others, e.g., CŒLOGYNE, it remains attached by a filament (tt. 491, 497). The polliniums have slender stalks (*caudicles*) ending in a swelling or an elastic band which is or becomes attached to an easily removed piece of the top edge of the column, called the rostellum (t. 513).

The two stigmas are usually combined as a slightly hollowed sticky surface on the front of the column below the anther: in Habenaria longicalcarata (t. 519) they project on either side as curved green processes.

All these structures are very cleverly and wonderfully adapted for causing the transference of pollen from one flower

to another by insects which are attracted as a rule by honey secreted in the sac or spur of the lip. The mechanism varics very considerably and orchids are so highly specialized in this respect that often pollination fails and no seeds are set simply because the proper insect for that species has not visited the plant. In general the head or proboscis of a bee, probing the spur for honey, touches the rostellum which adheres to it, so that when the insect flies away the anthers open and the polliniums are dragged out and carried off. A bending of the stalk of the pollinium as it dries during the insect's flight may, if necessary, bring the pollen-mass into such a position that in another flower it touches the stigma. The elasticity of the connecting band or of the thread which binds the groups of pollen together allows of some being left on the stigma while the rest may be carried to another flower.

The fruit is a capsule containing an enormous number of very small seeds which are easily carried by the wind, and this perhaps explains why so many orchids grow high above the ground on the branches of trees.

Throughout the family there is a remarkable diversity in the form of the flower which may even imitate the appearance of some insect (e.g., the Bee and Fly orchids of England). The size, brilliancy and lasting qualities of many species have made them favourites with horticulturists who are constantly producing hybrids.

The vegetative parts vary also considerably. There is always a perennial root stock ; but this may consist of tubers or of a creeping rhizome. In some the shoot grows on year after year bearing flowers laterally (a monopodium, t. 505), in others it finishes each season's growth with an inflorescence (sympodium, t. 491). This character is of considerable importance in classifying the genera. The genera also differ in habit, some growing exclusively on the ground, others always on rocks or trees (as epiphytes).

The family is one of the largest among flowering plants, having over 400 genera and 5,000 species. Of these 1,600 have been found in India, most of them peculiar to the country. The south-east Himalayas, Assam and North Burma is the richest area : the Deccan is comparatively very poor.

KEY TO THE GENERA.

a { Orchids of trees or rock faces . . . . b
a { Ground orchids . . . . g

Tree Orchids.

In all these the polliniums lie on the top of the column under a movable cap.

b { Stem stout, leaves oblong unequal at tip c
Stem green cylindrical, leaves similar . . . . d
Stem jointed, extended and leafy or of one or two pseudo-bulbs . . . . p. 566. DENDROBIUM.
A number of tubers (pseudo-bulbs) side by side . . . e
Stem slender creeping, with pseudo-bulbs at intervals . . p. 567. CIRRHOPETALUM.
Stem slender creeping. No pseudo-bulbs . . . . . . p. 582. CLEISOSTOMA.
No stem. Leaves sword-shaped . . . . p. 561. OBERONIA.

c { Flowers pink; $\frac{3}{4}$ inch or more. Spur oblong . . . . p. 578. ÆRIDES.
Flowers $\frac{1}{2}$ inch striped yellow and brown . . . . . p. 580. SACCOLABIUM.
Flowers $\frac{1}{4}$ inch, spur double, short and pointed . . . p. 582. DIPLOCENTRUM.

d { Flowers $\frac{1}{8}$ inch, with $\frac{1}{3}$ inch spur, brown or pink . . . . p. 580. SACCOLABIUM.
Flowers $\frac{1}{3}$ inch, concave. No spur. p. 577. LUISIA.

e { Pseudo-bulbs flat, $\frac{1}{8}$ to $\frac{1}{4}$ inch. p. 568. ERIA.
Pseudo-bulbs as long as broad or longer . . . . p. 568. ERIA and *f*

f { Flowers purple, $\frac{1}{8}$ inch triangular (foot very long) . . . p. 577. POLYSTACHYA.
Flowers 1 inch white or coloured. Foot long . . . . p. 566. DENDROBIUM.
Flowers 1 inch white or yellowish. No foot . . . . p. 570. CŒLOGYNE.

Ground Orchids.

g Polliniums on top of column, covered by a movable cap . . . . *h*.
Polliniums at sides of the column removable through, usually, vertical slits . . . . *m*

h Flowers white, small in a dense spiral . . . . . . p. 583. SPIRANTHES.
Flowers white, $\frac{1}{3}$ inch, the lip of two-fringed parts . . . . p. 584. CHEIROSTYLIS.
Flowers coloured, few or in a loose spike . . . . . .

i Leaves broad, strongly ribbed and plaited fan-wise . *i*
Leaves flat narrow, or absent at flowering time . . *j*

j Flowers $\frac{3}{4}$ inch, flat, mauve (or white) : lip spurred . *k* p. 574. CALANTHE.
Flowers $\frac{1}{4}$ to 1 inch ; purple : no spur . . . . *l*
Flowers $1\frac{1}{4}$ inches, jug-shaped. . . . . p. 570. ACANTHOPHIPPIUM.

k Column not taller than broad. Lip toothed . . . . p. 563. MICROSTYLIS.
Column twice or more times as high as thick. Lip. . . p. 565. LIPARIS.

l Stem naked at flowering time : sepals and petals not toothed, oblong, equal. p. 575. EULOPHIA.
Stem reed-like, leafy : flower crimson . . . . p. 575. ARUNDINA.

m Ovary not twisted : two slender spurs in front . . . p. 595. SATYRIUM.
Ovary twisted : spur if any behind . . . . *n*

n Lip entire or notched : pink or purple . . . . . . p. 594. PHYLLOMPHAX.
Lip with narrow midlobe and 1 inch wide much cut side-lobes : white . . . . p. 593. PLATANTHERA.
Lip three-lobed : flower white, greenish or yellow . . *o*
Lip curled up over column, its place in front taken by two flat or twisted sepals ; pink. . p. 596. DISPERIS.

o Sepals erect with petals, over column: flower greenish. p. 591. PERISTYLUS.
Sepals spreading flower white (or yellow) . . . . . p. 584. HABENARIA

OBERONIA. F.B.I. 148 I.

Epiphytes growing on the branches of trees to which they attach themselves by roots. Leaves in two ranks, closely fitting at the base, sword-like (i.e., compressed sideways as in Iris) thick, equally green on both sides. Inflorescence terminal. Flowers very small, in dense cylindrical spikes 3 to 4 inches by $\frac{1}{4}$ inch, terminating the main axis. Sepals broadly ovate. Petals smaller. Lip four or two lobed, concave embracing the short column to which there is no foot. Anther caps without retaining filament. Polliniums four, waxy, without attachment.

Species about 50 in tropical Asia and Africa and islands of the Pacific and Indian Oceans. Not as a rule cultivated.

a Peduncle of spike not flattened as base . . . . *b*
Peduncle flattened, with a leaf-like bract adnate to it . *c*

b Petal as wide as the sepals : lip of 2 crenulate rounded lobes . . . . O. verticillata.
Petal narrow : lip with fish-tail mid lobe . . . . . . O. Wightiana.

c Flower orange or brown . . . . . O. Brunoniana.
Flower pale straw colour . . . . O. platycaulon.

Oberonia verticillata *Wight, Herb. Wight Prop.* 179 ; *F.B.I.* v 677, I 9. Leaves 2 to 4 inches by $\frac{1}{3}$ to $\frac{1}{2}$ inch. Spikes up to 10 inches ; flowers in whorls $\frac{1}{5}$ to $\frac{1}{4}$ inch apart. Lip broadly obcordate, of two rounded crenulate lobes and two minute lobes behind. Petals only slightly narrower than the sepals. Capsule $\frac{3}{10}$ inch. Wight Ic. t. 1626.

Nilgiris : on the lower edge of the plateau, Avalanche, Pykara, not near Ootacamund. Pulneys : Levinge stream and below Glen Falls near Kodaikanal, but not on the downs. Shevaroys : near Yercaud.

Oberonia Brunoniana *Wight, Herb. Wight Prop. ! ; F.B.I.* v 681 I 24. Leaves 10 to 14 inches by ½ to 1 inch. Spikes as long, its stalk clasped in the bottom quarter by a leaf ; above, for 1 inch flattened and broadened like a leaf. Flowers sessile reddish orange, or with dark brown sepals and lip, and pale petals. Lip roundish very dense like a rat's tail of two broad crenulate basal lobes and a pair of much smaller terminal lobes with a still smaller lobe between them. Petals narrow. Capsule ¼ inch. **t. 486.** Wight Ic. t. 1622.

Nilgiris : near Ootacamund and down to Pykara and Naduvattam. Pulneys : below Kodaikanal on Church Cliff.

Oberonia Wightiana *Lindl. ; F.B.I.* v 683, I 32 ; common Nilgiri Oberonia. Leaves 2 to 6 by ½ inch. Spikes up to 14 inches, with pale yellowish-green flowers to within 1 inch of the base, very slender : pedicel $\frac{1}{16}$ inch. Lip with a terminal pair of acute lobes, diverging and curved, like a fish's tail, with their inward margins toothed, and a pair of basal lobes as large, each slightly two-lobed. Petals narrow. Capsule ⅛ inch. **t. 487.** Wight Ic. t. 1628.

Nilgiris : common in woods on the whole plateau. Pulneys : in sholas beyond the Observatory, Poombari, etc.

Gen. Dist. Also Ceylon.

Oberonia platycaulon *Wt. F.B.I.* v 682, I 26. A much bigger plant than the foregoing, leaves up to 12 inches by 1 inch. Peduncle flat below, the bract-like leaf short but carried up to near the top. Flower $\frac{1}{7}$ inch, pale. Lip with broad rounded basal or lateral lobes and terminal of 2 much smaller with a third smaller between (whole lip consequently five-lobed). Petals narrow. Capsule ⅓ inch.

Nilgiris : on the western downs, Mukarte.

MICROSTYLIS. F.B.I. 11.

Ground orchids with broad corrugated leaves in two ranks and fitting over each other at the base, and terminal spikes of brownish or purplish flowers. Lip erect concave, embracing the column at the base : upper sepals oblong recurved : lower one and the other two petals narrow. Column very short, flanked on each side at the top by rounded arm : anthers erect, polliniums four.

Species about 50 to 70, in the northern half of the tropics.

KEY TO THE SPECIES.

a { Flower purplish green : lip kidney-shaped, toothed . . *b*
Flower yellow : lip fan-shaped, deeply toothed . . . M. Stocksii.

b { Lip not toothed : small or large plant . . M. Wallichii.
Lip with nearly even triangular teeth. Stem stout. . . M. versicolor.
Lip with several narrow filiform lobes and a broader middle tooth, stem slender . . . . M. densiflora.

NOTE.—Microstylis Rheedii of *Wight* of the F.B I. and my Flr. N. & P. Ht. is now identified (in F.M.P.) with M. versicolor of *Lindley*, an older name : and M. versicolor of *Wight* is now named M. Densiflora by Fischer.

Microstylis Wallichii *Lindl. ; F.B.I.* v 686, II 1. Leaves 2 to 4 by 1½ to 2 inches, spike rising 6 inches. Flowers purple. Lip rounded with crenulate, hardly toothed margin : sides produced upwards as two acute auricles.

Nilgiris : Ootacamund, flower September. Pykara.

Gen. Dist. From Simla southwards on the Himalayas to Travancore.

Microstylis versicolor *Lindl.;* formerly M. Rheedii *Wt. ; F.B.I.* v 690, II 18. Stem stout, 3 to 6 inches, bulbous at the base. Leaves 3 to 5 by 1¼ to 2½ inches, five to seven nerved at the base, acute or acuminate : leaf-stalks sheathing at the base. Raceme 2½ to 3 inches,

raised by as much above the last leaf. Flowers fragrant, variable in colour and size, sepals narrow $\frac{1}{5}$ to $\frac{1}{3}$ inch by $\frac{1}{20}$ inch. Petals $\frac{1}{4}$ to $\frac{1}{40}$ inch. Lower lip rounded, broadly triangular or kidney-shaped, slightly lobed or pectinate. Stylar column $\frac{1}{8}$ inch. Capsules $\frac{1}{2}$ to $\frac{1}{4}$ inch. Wight Ic. t. 902.

Pulneys : Bearshola near Kodaikanal, but not common at these levels. Much more so below. Shevaroys.

Gen. Dist. Western Ghauts, Deccan, Shevaroys, etc.

Microstylis densiflora *Fischery;* formerly M. versicolor *Wight ; Herb. Wight Prop.* 178 *! ; F.B.I.* v 691, II 19. Stem slender green leaves usually two only ; but smaller scarious ones sheathe the lower part of the stem and the small false bulb. Green leaves 2 to 3 by $\frac{3}{4}$ to $1\frac{1}{4}$ inches, ovate acute, wrapped round the flowering axis and each other at the base, and folded along the five or more nerves. Flowering axis 2 to 8 inches naked, bare below, above with $\frac{1}{4}$ inch lanceolate, deflexed bracts. Flower-stalks $\frac{3}{16}$ to $\frac{1}{4}$ inch, very slender, spur as long, slender. Lip circular or kidney-shaped, deeply toothed. Lateral sepals ovate. Petals narrow. **t. 489.** Wight Ic. t. 901.

In woods. Nilgiris : Kotagiri and above to Ootacamund. Pulneys : on the downs. Shevaroys : flower summer.

Gen. Dist. South Indian hills and Ceylon.

Microstylis Stocksii *Hook. f. ; F.B.I.* v 691, II 21. Stem 2 to 4 inches. Leaves $1\frac{1}{2}$ to 4 inches. Spike 3 to 5 inches. Flowers yellow large. Flower $\frac{1}{2}$ inch. Lip broadly fan-shaped, deeply cut into narrow segments.

Pulneys : on the downs above Kodaikanal.

Microstylis. *Species not identified.* Like M. Stocksii but margin of lip recurved, hardly but freely toothed. **t. 488.**

Pulneys : Kodakianal.

LIPARIS. F.B.I. 148 III.

Terrestial (or epiphytic) herbs like MICROSTYLIS with broad leaves plaited on the veins, and terminal spikes of flowers : but differing from MICROSTYLIS in the column being about twice (or more times) as long as broad, often curved, and with wings but not the horse-shoe shaped structure at the top.

Species about 100 in the temperate and tropical regions.

Liparis Walkeriæ *Graham ; F.B.I.* v 698, III 28. A fleshy herb, 2 to 6 inches high, streaked with purple. Base thickened. Leaves two or three only, broadly ovate, acute or acuminate, distinctly unequal at the base, with many ribs and folded along them, very variable in size, from 3 by 2 to 5 by 4 inches (when in fruit). Flowering spike 2 to 4 inches bract $\frac{1}{6}$ to 1 inch linear. Ovary $\frac{1}{4}$ inch and pedicel as long. Flowers purplish brown. Column $\frac{1}{12}$ to $\frac{1}{8}$ inch slightly curved with an angular wing on each side just below the top. Dorsal sepal oblong three-veined. Lateral sepals obliquely ovate five-veined. Petals narrow one-veined. Lip $\frac{1}{4}$ to $\frac{1}{5}$ rounded, or broadly obtuse ; concave and with margins bent over, and 2 prominent swellings at the narrow base.

Shevaroys : in grass on Shevaroyan, flower September.

Gen. Dist. Low Hills and the Deccan, to the Central Provinces and to Ceylon.

Liparis atropurpurea *Lindl. ; F.B.I.* v 698, III 29. Very similar to the last but the leaves more unequal at the base, the racemes taller, the flower larger (sepal up to $\frac{2}{3}$ inch and the column with large rounded wings. Flowers dark purple.

Nilgiris and Pulney Hills at high elevation.

Liparis viridiflora *Lindl. ; F.B.I.* v 704, III 57. An epiphytic orchid with pseudo-bulb $\frac{1}{2}$ to 1 inch variable in shape. Leaves two only, elliptic sessile or nearly so,

with midrib and about 6 pairs parallel veins. Scape 3 to 5 inches with a few membranous bracts below the raceme. Pedicels recurved, flower ascending, white or yellowish or green. Sepals one-veined.

Pulneys: Periya Shola below Kodaikanal, Nilgiris, and High Way Mountains.

Gen. Dist. Sikkim, Khasia and to Ceylon and Java.

DENDROBIUM.

Epiphytic orchids with jointed (sympodial) stems or a series of pseudo-bulbs, leaves folded in bud but not plaited and the column in the flower extended forwards at the base into a long foot which bears the sepals on its sides and the lip hinged to its tip.

A large genus of about 300 species in tropical Asia, Australia, Japan and Polynesia. Many are cultivated.

KEY TO OUR SPECIES.

a { Stem of one or two short pseudo-bulbs only. Flower 1 inch, white . . . . D. nanum.
Stem elongate, tufted, leafy . . . .

b { Leaves 4 by 1 inch . . . . . . D. macrostachyum.
Leaves 2 by $\frac{1}{4}$ inch . . . . D. herbaceum.

Dendrobium nanum *Hook. f.*; *F.B.I.* v 717, VIII 25. A small epiphytic orchid. Stem of two or more small pseudo-bulbs, bearing apically 2 or 3 narrow leaves (2 by $\frac{1}{4}$ inch) and the slender rachis of the flowering racemes. Bracts $\frac{1}{5}$ inch. Pedicels $\frac{1}{2}$ inch. Flower $\frac{3}{4}$ inch, sepals and petals $\frac{1}{2}$ by $\frac{1}{12}$ inch, white. Lip yellow, midlobe roundish crenulate, side lobes small. **t. 490.**

Nilgiris: Naduvattam, flower September. Shevaroys: on Shevaroyan.

Gen. Dist. Western Ghauts.

Dendrobium herbaceum *Lindl.*; *F.B.I.* v 719, VIII 35. Stems many pendulous, polished and shining. Leaves $1\frac{1}{2}$ to 2 inches by $\frac{1}{4}$ inch. Racemes terminating

short lateral branches, few-flowered. Flowers $\frac{1}{4}$ inch, sepals and petals linear-oblong, obtuse, three-nerved. Lip small, side lobes minute or absent. Capsule $\frac{3}{4}$ inch oblanceolate.

Nilgiris : Naduvattam, fruit May. Not seen in flower.

Gen. Dist. At lower levels. F.M.P. gives Western Ghauts, 2,000 to 4,000 feet.

Dendrobium macrostachyum *Lindl. ; F.B.I.* v 735, VIII 101. Stems slender, pendulous, cylindrical 1 to 2 feet. Leaves oblong, ovate acute, 3 to 4 by 1 inch. Flowers pale green or yellow or tinged with pink, two or three together peduncled laterally on long leafless or leafy stems. Pedicels $\frac{3}{4}$ inch. Sepals and petals oblong lanceolate, curved. Lip oblong acute flat, crenulate.

Western Ghauts 7,000 feet. [F.M.P.] not seen.

CIRRHOPETALUM. F.B.I. 148 XI.

Tree orchids with long cylindrical creeping stem, often clothed with small scales or their fibrous remains, and each section of an inch or so ending in an upright tuber or *pseudo-bulb* bearing at the top a single, thick, oblong-oval leaf jointed to it and folded in bud, and on one side a slender axis with two or three bracts and a terminal whorl of flowers, peculiar in the two side sepals being three or four times as long ($\frac{1}{2}$ inch) as the petals ($\frac{1}{6}$ inch) and projecting in front like a double lip.

Species 40, chiefly in India and Malaya.

Cirrhopetalum Thomsoni *J. D. Hooker ; F.B.I.* v 778, XI 27. Stem $\frac{1}{8}$ inch thick ; tubers $\frac{1}{2}$ to 2 inches apart, $\frac{1}{2}$ to $\frac{3}{4}$ inch high, conical, green. Leaf elliptic or linear-oblong, obtuse, 2 inches by $\frac{1}{2}$ inch with a fair midrib and numerous parallel slender nerves, thick and leathery, and falling off by a clean joint from the top of the bulb. Flowering axis very slender, with two to three

small-scale sheaths at the base, and thin, ovate bracts $\frac{1}{6}$ inch. Flowers umbelled, four to five standing horizontal. Side sepals $\frac{1}{2}$ inch by $\frac{1}{8}$ inch, lanceolate, curved, five-nerved, yellowish-green with small reddish purple spots near the somewhat broader base, quite free of one another: dorsal sepal $\frac{1}{6}$ inch, marked with five reddish streaks and a network. Side petals $\frac{1}{8}$ inch, three-nerved. Lip jointed to the projecting foot of the column, itself short, curved backwards and upwards. Pollen masses, four, more or less connected in pairs.

Pulneys: in sholas near Kodaikanal. Nilgiris: on the western edge, Bangitappal. Naduvattam.

ERIA. F.B.I. 148 XIX.

Small tree orchids remarkable for the round rather flat or cylindrical pseudo-bulbs, jointed together in rows, from the youngest of which rise a pair of lanceolate leaves, set exactly opposite each other and jointed to their bases, and a very slender flower-axis with one or several white star-like flowers.

Species: about 80 in tropical Asia.

KEY TO THE SPECIES.

Pseudo-bulbs flat, $\frac{1}{2}$ inch enclosed in a network, flower 1 inch across, solitary . . . . 1. E. braccata.

Pseudo-bulb flat, $\frac{1}{4}$ inch, naked flowers $\frac{3}{4}$ inch, two to five on the stalk . . . . 2. E. nana.

Pseudo-bulb erect, 2 inches, flowers $\frac{1}{4}$ inch, 7 in a raceme . . 3. E. polystachya.

1. **Eria braccata** *Lindley* (E. reticosa *Wight*); *F.B.I.* v 787, XIX 6. A small tree orchid distinguished by very distinct netting over the flat round tubers, and the single large white flower, over an inch across on the slender stalk.

Tubers $\frac{1}{3}$ to $\frac{1}{2}$ inch, less than $\frac{1}{6}$ inch thick, joined in rows and each enclosed in a very thin covering with a raised network of veins. Leaves from an as yet unformed tuber, at the end of the row ; with two or three imbricating sheathing scales below ; $1\frac{1}{4}$ to $1\frac{3}{4}$ inches by $\frac{1}{4}$ to $\frac{1}{3}$ inch, elliptic acute. Flowers solitary on slender 1 inch pedicels. Sepals and petals spreading, starlike : dorsal sepal $\frac{1}{4}$ inch, obscurely five-nerved ; lateral, $\frac{3}{8}$ inch at the widest, curved, attached to the long foot of the column. Petals $\frac{1}{6}$ inch wide, narrowed at the base. Lip erect rising from between the incurved ends of the sepals ; its middle or terminal lobe $\frac{1}{5}$ inch wide with finely crenulate margin and white triangular tip, the rest orange yellow, with two central crested ridges which run back to the base of the column ; side lobes erect $\frac{1}{8}$ inch high, their upper edges purple. Polliniums four, attached altogether. Ovary $\frac{1}{8}$ to $\frac{1}{6}$ inch, with six prominent crenulate ridges. Pod $\frac{1}{2}$ inch. **t. 491.** Wight Ic. t. 1637 (*E. reticosa*).

Nilgiris : in shola, common. Odour distinct though faint. The flower is as large as Cœlogyne odoratissima and very like it in general appearance.

Genl. Dist. Western Ghauts and Ceylon. Not collected on the Pulneys.

2. **Eria nana** *A. Rich. ; F.B.I.* v 789, XIX 14. Tubers smaller $\frac{1}{4}$ inch, otherwise similar to the last except flowers 7 or 8 in a raceme very thin, pale. Petals $\frac{1}{2}$ inch. Polliniums 8 pear-shaped. Pod $\frac{1}{8}$ by $\frac{1}{16}$ inch, capped by the dried perianth. **t. 492.** Wight Ic. t. 1642 lower right hand figure (Dendrobium filiforme).

On trees, especially horizontal branches, often in damp moss ; slopes of " Snowdon." Not common on the Kodaikanal and Ootacamund downs. Not known apparently except on those hills.

In t. 492 : *a.* flower with a lateral sepal and a lateral petal torn off to show the lips sessile on the foot of the column and incumbent, with edges crenulate. (*E.T.B.*)

3. **Eria polystachya** *A. Rich.; F.B.I.* v 792, XIX 28. Pseudo-bulbs cylindrical erect, 1 to 3 by $\frac{1}{2}$ inch clothed with leaf-sheaths. Leaves elliptic 3 by $\frac{3}{4}$ inch, nine-nerved with numerous white dots (marking stomas) on the underside. Racemes 3 to 4 inches. Slender pubescent. Flowers $\frac{1}{4}$ inch, pale yellow, pedicels $\frac{1}{3}$ inch. Lip with a two-arched thickened purple or brown ridge towards the base and bright yellow tip. **t. 493.**

Nilgiris : Naduvattam, flower September.

ACANTHOPHIPPIUM. F.B.I. XXIII.

Ground orchids with broad plaited leaves, and lateral racemes of flowers, in which the base of the column is long and bent up again, so that the perianth forms with it a jug-shaped hollow.

Species 3 or 4 only in India and Malaya.

Acanthophippium bicolor *Lindl.; F.B.I.* v 815, XXIII 1. Pseudo-bulbs corrugated, 1 to 2 inches long. Leafy shoots with a few scales and one or two elliptical leaves 8 by 2 inches, plaited on the 5 main veins. Flowering stems lateral. Bracts 1 inch, thin. Flowers 3 to 7, 1 inch by $\frac{3}{4}$ inch, with stalk (or any) attached about the middle of the back, five-lobed at the top and split in front. Lip narrow in the lower (1 inch) part, then widening with erect hatchet-shaped lateral lobes, and tongue-like yellow midlobe with 3 ridges on its palate. **t. 494.**

Shevaroys : Green Hills. Flower June. Nilgiris : and Pulneys below the plateau.

CŒLOGYNE. F.B.I. XXXIV.

Epiphytic plants, growing on trees, with short creeping rhizome made up of annually renewed, tuberous, erect sections, clothed at first by scale leaves but later on swollen and bare, and bearing at the top one or two of the few foliage leaves. These tubers stand in two rows,

to right and left of the main line. The year's section not swollen, ending in a slender flowering axis (scape) bearing a few large flowers. Leaves evergreen, but with a joint at the base of the blade, so that the blade separates very easily from the top of the tuber or leaf-sheath. Sepals and petals nearly equal, spreading out reflexed: lip with two side-lobes erect and clasping the column, and a middle lobe with raised corrugations, not spurred or saccate. Column slightly curved, winged towards the top, and often with two staminodal auricles. Anthers pendulous with distinct stalk, incumbent on the three-lobed rostellum, covered by a hood. Polliniums four, cohering in pairs by short granular caudicles.

The annual tuberous sections, each ending ultimately in a flower, are sufficient to distinguish Cœlogyne from all our other orchids except Spiranthes and Cheirostylis, which are ground plants. Though formed every year, the sections and their leaves are perennial, and remain green for many years.

Species 50 to 70. All in India and the Malay Islands. This genus has furnished some of our most beautiful cultivated orchids.

a { Flowering axis enclosed at the base with short sheaths only . . . . *b*
Flowering axis with two green leaves above the sheaths . *c*

b { Lip with 2 keels . . . . C. mossiæ.
Lip with 3 keels . . . . C. angustifolia.

c { Tuber 1 inch or less: lip with 3 ridges: leaves 2 inches. C. odoratissima.
Tuber $1\frac{1}{2}$ inches: lip with 3 or 5 ridges: leaves 1 to 5 inches . . . . C. nervosa.
Tuber 2 to 4 inches, lip with 4 ridges: leaves 3 to 9 inches. C. glandulosa.

The species are not easily distinguished when not in flower and I am not certain of some of the localities given below.

Cœlogyne odoratissima *Lindley*; *F.B.I.* v 834, XXXIV 25; the sweet-scented Plantain Orchid. Tubers

variable, from ½ to 1 inch by ½ inch, slightly wrinkled, clothed only at the base by the brown remains of the scales. Leaves 2 by ½ inch, less or more, thin, acute at both ends, with light midrib and two dark green nerves as well as other slenderer ones. Spike longer than the leaves, slender with one to three flowers only. Bracts ¾ inch, light brown and scarious : pedicel ¼ inch : ovary shorter. Sepals 1 by ¼ inch, keeled. Petals as long, but narrower. Terminal lobe of lip ½ by ⅜ inch, curled down at the tip and the sides : lateral lobes ⅛ inch high, projecting forwards ⅕ inch beyond their attachment to the rest ; space between with three raised crenulate ridges, the lateral of which run on to the terminal lobe and are there coloured like its middle patch, yellow. Column very slender in general shape oblanceolate, ½ inch high, 1/20 inch wide at the base, ⅛ inch near the top, the winged margin forming a hood round and over the anther. Anther sac showing as an oval yellow body ; polliniums four, in two pairs. The flower with the lip nearly horizontal obviously as a platform for bees to alight on.

On trees, growing commonly in dense masses, distinguished from the other species by the thin and smaller leaves and the few flowers. **t. 495.** Wight Ic. t. 1640.

Nilgiris : on the downs in sholas common, Dodabetta to Avalanche and Bangitappal. Flowers from May to July. Not collected at Kodaikanal.

Gen. Dist. Also Ceylon.

Cœlogyne nervosa *A. Rich. ; F.B.I.* as C. corrugata *Wight*, v 835, XXXIV 26 ; the lesser Plantain Orchid. Tubers ovoid, deeply wrinkled or corrugated, 1 by ¾ inch ; the oldest with the remains of the old flowering stem ; younger with two leaves and a fruiting stem ; youngest, still unformed, ¼ inch thick, covered with

imbricating scales, the uppermost and innermost of which become the two green leaves, and having a flowering spike. Leaves elliptic, 4 by $1\frac{1}{4}$ inches, hard. Spike 4 inches, bracts 1 by $\frac{1}{6}$ inch, conspicuous spreading, scarious and light brown while the flower is open, and persistent till the pod forms. Sepals and petals 1 inch, white, elliptic. Midlobe of lip rounded, $\frac{1}{4}$ by $\frac{1}{4}$ inch : side-lobes $\frac{1}{6}$ inch high. Column $\frac{1}{2}$ inch, slender, curving forwards at the top, prominently winged and also projecting $\frac{1}{16}$ inch well above the anther. Anther hinged to the flap. Polliniums four, joined at the base. Pod $1\frac{1}{4}$ by $\frac{1}{2}$ inch, deeply five-angled. **t. 496.** Wight Ic. t. 1639. (C., corrugata, not t. 1638.)

Pulneys : in sholas round Kodaikanal. Nilgiris : Coonoor top of Sispara ghaut.

Richard's *nervosa* is an earlier name than Wight's *corrugata.* The species therefore stands as C. nervosa *A. Rich.*

Cœlogyne Mossiæ *Rolfe ;* XXXIV 27. Tubers ovoid wrinkled. Leaves 4 to 6 by 1 to $1\frac{1}{2}$ inches about nine-nerved. Spikes five- or six flowered, clothed at the base in sheaths. Flowers $1\frac{1}{2}$ inches white, sepals and petals 1 by $\frac{1}{4}$ to $\frac{1}{2}$ inch. Lip with two raised ridges. Capsule $1\frac{1}{2}$ by $\frac{3}{4}$ inch. Fruiting peduncle about 6 inches with two leaves only at the base. **t. 497.**

Nilgiris : on the downs.

On rocks. Pulneys : near Kodaikanal. Nilgiris : Biccapatti, Bangitappal. In my Fl. N. & P. Ht., I suggested this was rare. I am inclined to think however that this is the commonest of the big plantain orchids.

Cœlogyne angustifolia *; F.B.I.* v 833 in part, as C. breviscapa, XXXIV 18. Similar to the last but smaller. Tubers about 1 inch. Leaves 4 to 6 by $\frac{3}{4}$ inch. Bracts $\frac{3}{4}$ inch. Sepals and petals $\frac{3}{4}$ inch white. Lip tinged with yellow with 3 ridges.

Nilgiris : at 6,000 feet. Also on North Kanara.

Cœlogyne glandulosa *Lindley ; F.B.I.* v 835, XXXIV 27 ; the Plantain Orchid. Tubers 2 to 4 by 1 inch, contracted at each end, curved. Leaves 4 to 12 by 1¼ inches. Stalk of racemes sheathed almost to the flowers by enveloping bracts and two large leaves. Floral bracts 1¼ by ⅓ to ½ inch. Flower-stalks 1 inch. Sepals and petals 1¼ by ½ inch, pure white. Centre of lip with a pair of high ridges and a pair of lateral shorter ones, all smooth. Wight Ic. t. 1638.

On rocks. Pulneys : near Kodaikanal, Pamban stream, etc.

CALANTHE. F.B.I. 148 XXXVII.

Large ground orchids with broad longitudinally plaited leaves, wrapping round each other in bud, but not in two ranks. Flowering shoot lateral on the stem (not terminal). Sepals and petals approximately equal. Lip adnate to the short column. Polliniums eight, slender.

Species about 40, mostly in tropical Asia, but also in Japan, islands of the Pacific and Indian Oceans, tropical Africa, Central America, Mexico and the West Indies.

Calanthe veratrifolia *Brown ; F.B.I.* v 851, XXXVII 15 ; the big Wood Orchid. A large plant, with the habit of a Eucharis Lily but the leaves folded between the main veins like a fan, and tall racemes of white flowers, with lip bifid and spreading out flat, and long slender spur.

Stem tuberous, growing in the ground with long thick roots. Leaves spirally placed, plaited (like a fan) : stalk 6 inches, blade 10 inches by 4 inches, larger or smaller, dark green. Flowering axis about 2 feet. Flowers rather crowded towards the top : bracts 1¼ inches, lanceolate, acute, herbaceous ; upper smaller ½ inch : flower-stalk (ovary and pedicel) 2 inches. Sepals ½ inch, elliptic,

obovate, five-nerved ; petals equal, three or five-nerved : all five erect or spreading. Lip hanging prominently outwards, with four oblong lobes, two on each side, spreading outwards and attached to the foot of the column and forming with it a short canal leading to the hollow of the spur. Polliniums eight, slender. **t. 498.** Wight Ic. t. 1664.

In woods. Pulneys : close below Kodaikanal and in many other sholas. Nilgiris : Kotagiri, in Longwood shola ; Kodanad.

C. masuca *Lindley* with longer, narrower nearly stalkless leaves occurs at lower levels.

Gen. Dist. Deccan 6,000 to 7,000 feet, Kanara, Ceylon and on to Malaya and Australia.

ARUNDINA. F.B.I. 148 XXXIX.

Ground orchids with grass-like leaves and large red flowers, very much like that of CŒLOGYNE, but without any projecting foot at the base of the column, and with 8 polliniums. No spur.

Species few in India, Malaya and China.

Arundina bambusifolia *Lindl. ; F.B.I.* v 857, XXXVIII 1. Stem reed-like, nearly ½ inch thick, 1½ feet high, unbranched clothed with the papery bases of leaves. Leaves 6 to 10 inches by ½ to ¾ inch sheathing at the base folded in bud. Peduncle of raceme 6 inches, terminal flowers 1 or 2 only, 2 inches across, crimson. **t. 499.** Wight Ic. t. 166.

Pulneys : at foot of Perumal 5,300 feet.

EULOPHIA. F.B.I. 148 XXXIX.

Ground orchids flowering often before the leaves appear. Leaves rising from a lateral bud, rather narrow, plaited, arranged spirally, and convolute in bud, and jointed at their bases. Flowers in tall racemes. Sepals and petals similar, narrow, and not spreading much.

Column slender and long, curving forwards at the base. Lip with side lobes embracing the column, a middle lobe with raised ridges, and a short spur. Anther cap falling off completely. Polliniums two or four, attached by elastic straps to a thin oblong band fixed to an easily removed bit of the rostellum.

Species about 50, in all warmer parts of the world, especially tropical and South Africa, and Asia (one near Madras) ; but, also, in Australia two and in Brazil one. A few are cultivated.

Eulophia pratensis *Lindley* ; *F.B.I.* vi 4, XXXIX 10 ; yellow Ground Orchid. Flowering stem appearing before the leaves, 1 to 2 feet high ; with a few sheathing scales, slightly swollen at their attachment to the stem ; quite glabrous, green or purplish. Raceme 6 inches, the flowers about $\frac{1}{2}$ inch, apart. Bracts lanceolate, acute, $\frac{1}{2}$ inch : ovary plus stalk $\frac{3}{4}$ inch. Sepals elliptic, oblong, dirty yellow outside, purple inside, five-nerved. Petals nearly as long, obovate-oblong, clearer yellow. Lateral sepals attached by their $\frac{1}{8}$ inch wide bases to the shortly projecting base of the column, on to which also run the front edges of the two petals. Side lobes of lips embracing the column, each as wide as the middle lobe : middle lobe with three or four crested ridges running towards the opening of the short, triangular, backward pointing spur. Column deeply grooved, with the sides meeting across the middle at the top ; rostellum sloping downwards. Anther cap with a short projecting point, quite free. Polliniums two, attached by thin elastic bands to the removable part of the rostellum, globose. Capsule $1\frac{1}{4}$ inches elliptic, turgid. Leaves long petioled, 10 to 12 inches. **t. 500.** Wight Ic. t. 1666.

The flowers appear to vary considerably in size.

Pulneys : On the ridge above Silver Cascade, below Kodaikanal.

Eulophia nuda *Lindl.*; *F.B.I.* vi 5, XXXIX 18. A larger plant with leaf blades 12 to 15 inches long and sepals and petals 1 inch by $\frac{1}{4}$ inch. Pod nearly 2 inches long. **t. 501.**

Nilgiris: Eastern slope of Catherine Falls valley below Bandishola 6,000 feet. Pulneys: below Church Cliff, Kodaikanal.

Gen. Dist. Tropical Himalayas to the Deccan, and Ceylon.

POLYSTACHYA.

Tree orchids of the CŒLOGYNE type, i.e., with pseudobulbs, leaves folded in bud, and racemes of flowers terminating the year's shoot. Flowers small. Column very broad and extended in a long foot. Lateral sepals broad. Petals much narrower. Lip jointed to the end of the foot. Polliniums 4. Pod ovoid.

Species about 75 in tropical Asia, Africa and America.

Polystachya purpurea *Wt.*; *F.B.I.* v. 21, XLVII 2. Pseudo-bulbs not obvious. Leaves few, 2 to 5 by $\frac{1}{2}$ to 1 inch, elliptic. Peduncle of racemes 4 to 6 inches, compressed and angular. Bracts $\frac{1}{8}$ inch. Flowers purple $\frac{1}{8}$ inch, on a slender $\frac{1}{6}$ inch ovary. Column broad, winged: foot longer. Sepals a nearly equilateral triangle. Petals much smaller. Lip three-lobed the side lobes erect, the midlobe much the largest, crenulate rounded or notched: a high ridge on the palate. Fruit $\frac{1}{3}$ by $\frac{1}{4}$ inch; ellipsoid. **t. 502.**

Shevaroys: on Green Hills, flower Summer.

LUISIA.

Tree orchids with slender cylindrical stems and leaves, and short racemes, lateral on the branches, of flowers

of the ÆRIDES type. Column short, not extended as a foot: lip sessile at its base. Polliniums 2. Capsule narrow, erect.

Species about 15, in tropical Asia and Japan.

Luisia tenuifolia *Bl.; F.B.I.* vi 23, XLIX 2. Stems as thick as a lead pencil, a foot or more long. Leaves thinner 4 or 5 inches, also cylindrical. Racemes 1 to 2 inches. Flowers $\frac{3}{4}$ inch, yellowish and purple; sepals $\frac{1}{3}$ inch. Petals $\frac{1}{2}$ by $\frac{1}{10}$ inch. Lip narrow at the base and broadening outwards; with two minute erect lobes at the base and a notch in the broad apex. Capsule about 1 inch. **t. 503.**

Shevaroys: on Green Hills, flower June.

ÆRIDES.

Rock or Tree Orchids with stout perennial stem which continues growing at the end (monopodial growth) and thick whitish aerial roots (which absorb water through thin spongy covering). Leaves in two ranks and jointed to their bases if flat folded in bud. Flowers in lateral racemes from the axils of the leaves. Sepals and petals spreading. Lip divided distinctly into two parts, the forward one broad and jointed to the inner, which has erect side lobes and a spur and is itself attached to the prolonged base of the column. Pollinia 2.

Species about 50 in the tropics of Asia.

Flowers round: racemes spreading: on rocks. . A. crispum.
Flowers narrow: on trees . . . . A. ringens.
Stem and leaves cylindrical, slender . . A. cylindricum.

Ærides crispum *Lindley; F.B.I.* vi 45, LVIII 8; Common pink Rock Orchid. Stem thick as the middle finger, covered with the bases of the fallen leaves. Leaves

thick and close-set, 3 to 5 by 1 inch, notched and uneven at the end, green but with purplish blotches on the upper side. Racemes spreading or pendulous, longer than the leaves. Flowers rose-coloured, $\frac{3}{4}$ to $1\frac{1}{2}$ inches across. Sepals and petals broad, nearly round. Midlobe of lip nearly as broad as long, crisped along the margin : side lobes $\frac{1}{8}$ inch long, erect palate : with a slight ridge and two swellings. Spur $\frac{1}{3}$ inch cylindrical blunt. Column $\frac{1}{4}$ inch high ; with longer foot, the side sepals attached by their whole width to its underside and the lip at the end ; upper part winged, the edges almost hiding the deeply sunk stigma. **t. 504.** Wight Ic. t. 1677 bis.

On exposed rocks. Common on the Pulney downs, about Kodaikanal. Nilgiris : Coonoor.

Gen. Dist. Western Ghauts.

This is the Orchid commonly brought round for sale in Kodaikanal, a practice which should not be encouraged, for collectors of this type are ruthless in their destruction. In any case a plant, when done with, should not be thrown away, even if only a piece of stem, but carefully planted in a crevice on some rock.

Ærides ringens *Fischer* ; formerly A. radicosum *A. Rich ; F.B.I.* vi 46, LVIII 11 ; the larger pink Tree Orchid. Stem much as in the last. Leaves $\frac{3}{4}$ inch wide, 6 to 10 inches long, thick, strongly grooved, notched and unequal at the tip ; often spotted brown. Spike erect. Flowers less than half as wide as they are long : pedicel and ovary 1 inch, curving back against the axis of the spike. Dorsal sepal erect, nearly flat, oval, $\frac{1}{5}$ inch : lateral $\frac{1}{4}$ inch, forming with the smaller petals very flat sides to the flower. Midlobe of lip $\frac{1}{5}$ inch, broad and long, contracted suddenly at both ends : lateral lobes $\frac{1}{16}$ inch, the palate between with a double swelling. Spur $\frac{1}{4}$ inch, curved forwards, blunt : spur $\frac{1}{6}$ inch curved. Column $\frac{1}{4}$ inch strongly winged. Capsule on a stalk

of $\frac{1}{2}$ inch, 1 by $\frac{2}{5}$ inch, three-angled. **t. 505.** Wight Ic. t. 1673 (Saccolabium rubrum); Ic. t. 917 (S. Wightianum).

On trees, flowering before the rains. Nilgiris: Ootacamund in sholas common all over the downs to Bangitappal and Pykara on the west, and Kotagiri on the east. Pulneys: Pillar Rocks.

Gen Dist. Western Ghauts.

Easily distinguished from A. crispum by the narrow flowers, more shortly stalked spikes and flat not curved lip, and nearly always a tree-orchid, growing always in the shade, while the other grows mostly in the open on rocks.

Ærides cylindricum *Lindl.; F.B.I.* v 44, LVIII 3. Stem cylindrical, as thick as a quill. Leaves also 2 to 4 inches by $\frac{1}{6}$ inch. Peduncle of raceme short (about 1 inch) stout. Flowers few, $\frac{3}{4}$ to $1\frac{1}{2}$ inches, white or pinkish with yellowish lip. Sepals narrower than the broad petals. Side lobes of lip as large as midlobe, erect spur $\frac{1}{4}$ inch acute. **t. 506.**

Shevaroys: on Green Hills, flower summer.

Gen. Dist. Western Ghauts from Coorg to Travancore.

SACCOLABIUM. F.B.I. 148 LXI.

Sac-orchid.

Similar to the Rock Orchid, ÆRIDES, as regards the structure of the vegetative parts and the flower, and differing chiefly in there being no extended foot to the column, so that the lip, here comparatively small, is not carried out and is not divisible into two parts.

Species about 20 in the Indo-Malay region. Some cultivated.

KEY TO THE SPECIES.

Leaves slender, cylindrical: spur much longer than the sepals or petals . . . . S. filiforme.

Leaves strap-shaped: spur broad shorter than the sepals or petals . . . . S. pulchellum.

Saccolabium filiforme *Lindley ; F.B.I.* vi 56, LXI 3 ; yellow or pink Sac-orchid. Distinguished from all our other orchids by the slender green stems and round, stick-like leaves, and by the curved, drooping spikes of small, yellow-brown flowers, less than $\frac{1}{8}$ inch broad but with spurs twice as long, which hang down from their axils. Roots thick, white. Stem $\frac{1}{8}$ inch thick, green. Leaves more or less in two ranks 2 to 6 inches by $\frac{1}{10}$ inch or less, but tapering and sheathing the stem at the base. Spikes about 2 inches ; flowers dense ; bracts $\frac{1}{12}$ inch, acute ; stalk and ovary $\frac{1}{4}$ inch. Spur $\frac{1}{5}$ inch, brown. Capsule slender egg-shaped, $\frac{1}{4}$ inch, its stalk $\frac{1}{4}$ inch, the remains of the perianth persistent at the top. **t. 507.**

In the sholas frequent.

Appears to be in two varieties —

var. **nilgirica** : flowers pink, spur shorter than the ovary. Nilgiris : on the downs to Pykara and Naduvattam ; flowers May, etc.

var. **pulneyensis** : flowers yellow streaked brown : spur longer than the ovary. Pulneys : in sholas about Kodaikanal, not rare. Ceylon.

Gen. Dist. Also Central Provinces.

Saccolabium pulchellum *Fischer ; F.B.I.* v 60 (S. nilagiricum), LXI 21. Stem stout, attached to its support by a matting of aerial roots. Leaves strap-shaped, unequal at the tip, 3 to 8 by $\frac{1}{2}$ inch. Flowers about $\frac{1}{3}$ inch diameter in short corymbs, lateral on the stem : stalk about $\frac{1}{2}$ inch not twisted, so that the lip of all the flowers faces inwards. Sepals and petals $\frac{1}{4}$ inch strongly incurved, oblong rounded striped yellow and brown. Lip with broad sac at the base and a broadly

triangular lobe beyond. Pollinia attached by elastic straps to the rather long caudicle. **t. 508.**

Nilgiris : near Kotagiri in Catherine Falls valley. Pulneys : below Kodaikanal.

CLEISOSTOMA.

Tree orchids with creeping stem, and small flowers in lateral racemes. Spur short not septate, and its mouth almost closed with a callus or lamella.

Species about 20.

Cleisostoma tenerum *Hook.f. ; F.B.I.* vi 73, LXVI 7. Stem $\frac{1}{6}$ inch thick. Leaves sessile 2 by $\frac{3}{4}$ inch, oblong notched, flowers brownish, with darker lines. **t. 509.** Wight Ic. t. 1683.

Pulneys : near Kodaikanal in the Pambar ravine, and below. Nilgiris : Sispara Ghaut.

DIPLOCENTRUM. F.B.I. 148 LXX.

Tree orchids of the ÆRIDES type, i.e., stem growing continuously at the apex and without pseudo-bulbs : leaves in two ranks flat, folded in bud ; flowers in lateral loosely branched panicles and column short : but without extended foot to the column or hinged lip, and distinguished further by its short bifurcated spur, and a thick fleshy disc at the base of the lip.

Species about 3, in South India, Ceylon, Malaya.

Diplocentrum recurvum *Lindl.; F.B.I.* vi 78, LXX 1. Stem 2 to 6 inches. Leaves 4 to 9 by $\frac{1}{2}$ inch. Panicle larger, well branched. Flowers $\frac{1}{4}$ inch. Spurs narrow, conical incurved. **t. 510.**

Shevaroys : "Green Hills," flowering June.

SPIRANTHES. F.B.I. 148 LXXXVII.

Lady's Tresses.

Ground orchids with the small white flowers on a twisted spike.

Rootstock with thick white roots, and ending above in the flowering and leafy stem. Leaves spirally arranged, not jointed at the base. Middle sepal and petals forming a hood over the short column, but not fused together : lateral sepals free, with more or less parallel nerves. Lip different in shape, hanging down vertically, small, oblong, concave, crisped, hairy at the middle, with short spur. Anther erect, attached to the equally long, erect rostellum, two-celled, with two waxy polliniums pendulous from the top.

Species about 80 in tropical mountains and in temperate regions. In England three, the commonest being *S. autumnalis* Lady's Tresses.

Spiranthes australis *Lindley ; F.B.I.* vi 102, LXXXVII 1. Stem 6 to 8 inches, rather slender. Leaves mostly near the base, 2 to 5 inches, narrow oblanceolate acute, hardly $\frac{1}{2}$ inch wide, sheathing the stem for a short way. Stalk of spike slender ; flowering part 3 to 6 inches, the flowers close together in a dense spiral, white. Sepals $\frac{1}{6}$ by $\frac{1}{16}$ inch : petals slightly shorter. Lip three-lobed, with two glands at the base. Capsule $\frac{1}{4}$ inch, ribbed. **t. 511.**

Pulneys : common on the Kodaikanal downs, flowers summer. Nilgiris : in grass all over the downs.

Gen. Dist. On mountains throughout India, from the Punjab and Tibet to Ceylon and Chittagong. Eastwards to China, Japan, Australia, New Zealand ; northwards to Afghanistan and northern Asia.

var. **Wightiana.** Spike 1 to 2 inches dense : stem stout. Nilgiris : Kotagiri.

CHEIROSTYLIS.

Ground orchids. Flowers with a central column, as in the preceding genera, but pollen sacs distinct parallel, and pollen granular in two polliniums also the median sepal fused with the lateral petals to form a hood over the column. Stem erect, unbranched. Leaves thin rolled in bud. Flowers small in a spike. Column with two erect appendages in front. Lip with short sac at the base, and a bi-lobed and deeply cut limb.

Species 12 in tropical Asia and Africa.

Cheirostylis flabellata *Wight ; F.B.I.* vi 105, XC 5. Rootstock in appearance like artichoke, pinkish brown, lumpy. Stem hairy. Leaves $\frac{1}{2}$ to 1 inch, ovate-acute, sheathing at the base, three or five nerved : upper reduced to scales with distinct sheathing portion. Flowers five or six, $\frac{1}{4}$ inch across. Lip bifid, each half deeply fringed. Capsule egg-shaped, $\frac{1}{4}$ to $\frac{1}{3}$ inch. **t. 512.** Wight Ic. t. 1727.

In shady places. Nilgiris : near Ootacamund on Snowdon Pulneys : Bearshola and Church Cliff shola, near Kodaikanal. Flowering April.

Gen. Dist. Higher mountains of India from Bhotan southwards to Tenasserim and Ceylon.

HABENARIA. F.B.I. 148 CVI.

Ground orchids with slender stem and spirally arranged leaves which are not folded along the veins, but are at the base wrapped round the stem. Flowers usually white, in terminal spikes, with bracts. Lateral sepals spreading (distinction from the next species). Petals erect or spreading, sometimes divided. Lip with three lobes, the side lobes as wide as the midlobe, or much narrower or broad and toothed. Capsule ovoid or oblong.

Species about 400 in temperate and tropical regions.

KEY TO THE SPECIES.

a	Corolla yellow	12. H. Perrottetiana.
	Flowers white	*b*
b	Petals divided, one or both halves hair-like	*c*
	Petals not divided : lip three-lobed or partite	*d*
c	Spur $\frac{1}{2}$ inch : petal segments curled upwards	1. H. digitata.
	Spur 1 inch : petal segments straight	2. H. grandiflora.
	Spur 2 inches : petal segments curved up	3. H. rariflora.
d	Side lobes of lip broader than the middle lobe . . .	*e*
	Side lobes of lip not broader than the middle lobe . .	*f*
e	Flowers many, under 1 inch : lateral lobes of lip $\frac{1}{8}$ inch or less (Nilgiris)	5. H. cephalotes and 4. H. Richardiana.
	Flowers many, midlobe of lip $\frac{1}{4}$ inch wide, side lobes $\frac{1}{2}$ inch.	6. H. longicornu.
	Flowers one or two only : spur 3 to 4 inches	7. H. longicalcarata and 8. H. decipiens.
f	Flowers all facing one way : bracts embracing the flowers. Leaves ovate 1 to $1\frac{1}{2}$ inches . . .	10. H. Heyneana.
	Flowers spirally arranged	*g*
g	Leaves two only, flat on the ground, thick	11. H. crassifolia.
	Leaves several, on the stem, flowers $\frac{1}{3}$ inch greenish white	9. H. elliptica.

1. **Habenaria digitata** *Lindl.* ; *F.B.I.* vi 135, CVI 7. Characterized by having two pairs of filiform segments of petals curling upwards like horns. Tuber $\frac{3}{4}$ inch.

var. foliosa. Stem 6 to 10 inches, clothed at the base only with sheaths, above leafy. Leaves 1 to 2 inches, elliptic-ovate, acute, stem clasping ; upper smaller merging into the bracts. Flowers dirty white, in a dense spike 2 to 4 inches long. Bracts $\frac{5}{8}$ inch, ovate-acute, slightly longer than the ovary. Sepals $\frac{1}{4}$ inch ; lateral pair ovate-acute, curved spreading ; dorsal sepal round. Petals

each divided into two filiform segments curved upwards like horns. Lips deeply three-fid into narrow hair-like segments, the middle one longest. Stigmatic processes large straight. Pollen sacs curled upwards and outwards. Capsule ½ inch. **t. 513.** Wight Ic. t. 1700.

In the open, on grass downs. Nilgiris : on golf links, etc., to Avalanche and Coonoor, flowering August.

Gen. Dist. Nilgiris and northward on the Ghauts.

var. **travancorica** *Hook.f.* ; *Herb. Wight Prop.* '*H. lindleyana*' ! ; formerly H. travancorica H.f. *F.B.I.* vi 135, CVI 8. Lateral sepals ¼ inch, ovate-acute, pubescent on the inner side ; dorsal one round. Spur ½ inch, shorter than the ovary.

Stem 6 to 15 inches. Leaves 1 to 2 by ¾ to 1 inch, ovate-acute, uppermost narrower and acuminate. Bracts ⅝ to 1 inch, much longer than the ovaries. **t. 514.** Wight Ic. t. 922. (H. lindleyana.)

Pulneys : on the open grass downs, flowering autumn. *Fyson* 2133. *Bourne* 1199.

Very similar to *var.* foliosa, differing mainly in the sepals being pubescent.

2. **Habenaria grandiflora** *Lindl.* ; *F.B.I.* vii 136. CVI 13. A slender ground orchid with one roundish leaf on the ground, and two or three white flowers having a long, slender spur and fine filiform white segments projecting in front.

Basal leaf 1½ inches, nearly round deeply cordate and clasping the stem. Scape 3 to 6 inches, leafless except for a bract below a flower or at a forking (if any). Flowers usually 2 sometimes more, about 1 inch broad. Petals divided, the upper segment broad, lower filiform. Lip divided into 3, the lateral segments filiform, the

middle narrow, with recurved margins. Spur slender, longer than the ovary. **t. 515.**

Shevaroys : on the plateau, flowering June.

Closely allied to the next species of which it might be called a larger edition.

3. **Habenaria rariflora** *A. Rich.* ; *F.B.I.* vi 136, CVI 14. A samll white flowered ground orchid remarkable for the long slender curved spur and the four hair-like segments projecting from either side of the flower.

Stem 4 to 8 inches, clothed below by the sheathing bases of the leaves. Leaves close to the ground, 3 to 4 inches by $\frac{1}{2}$ inch, oblong-lanceolate, acute, folded, clasping the lower part of the stem by their sheathing bases. Upper part of stem with only a few bract-like sheaths. Bracts $\frac{3}{4}$ to $1\frac{1}{4}$ inches, narrow-lanceolate, acute. Pedicel $\frac{1}{2}$ to $\frac{3}{4}$ inch ; ovary as long. Spur 2 inches, incurved. Sepals triangular spreading, the posterior $\frac{1}{4}$ inch acute. Petals each of two parts ; the upper ovate-acute $\frac{1}{4}$ inch, the lower hair-like and twice as long, curved slightly upwards. Lip consisting of a narrow oblong middle lobe, $\frac{1}{3}$ by $\frac{1}{2}$ inch, from about the middle of which on each side a straight hair-like segment projects straight outwards (at half right and half left). Ovary usually not showing a twist. Pod 1 by $\frac{1}{5}$ inch. **t. 516.** Wight Ic. t. 924.

In the grass of the open downs on thin soil. Pulneys : above Kodaikanal, flower July. Nilgiris : on the lower slopes.

Gen. Dist. Bababoodons and Western Ghauts.

4. **Habenaria Richardiana** *Wt.* Ic. 1714 ; *F.B.I.* vi 139, 21. Similar to the next but spur twice as long as the ovary, and side lobes of lip not much wider than the

midlobe, finely toothed. Leaves narrower than in H. caphalobs. Flower white.

Nilgiris and Anamalai Hills [F.M.P.].

5. **Habenaria cephalotes** *Lindl.; F.B.I.* vi 139, CVI 22. Tuber elongate. Stem 3 to 6 inches, and raceme 2 to 4 inches : base stout with one or two sheaths. Leaves two or three only, 2 to 2½ by 1¼ inches, ovate ; succeeded by much smaller ones. Spike dense 2 to 4 inches : bracts 1 by ⅓ inch, lanceolate acuminate, longer than the ovaries. Lateral sepals ⅕ inch, pubescent, spreading ; dorsal smaller. Flowers white. Petals entire erect. Lip divided into three lobes : midlobe ⅛ inch, narrow : lateral lobes much broader. Spur curved forwards shorter than the beaked ovary. **t. 517.** Wight Ic. 5. 1711.

In open grass land. Nilgiris : on the downs near Ootacamund and down to Avalanche and Naduvattam. Flower after the rains. Not on Pulney downs.

Distinguished from the next by the broad fringed side lobes of the lip.

6. **Habenaria longicornu** *Lindl.; F.B.I.* vi 139, CVI 24. Stem ½ to 1½ feet. Leaves mostly from near the base, narrow, 6 by ½ inch. Flowers many in an oblong head. Bracts narrow acuminate, 1 inch. Ovary a little longer. Spur 2 inches. Sepals ovate, ⅓ by ¼ inch. Petals much smaller. Lip three-partite ; middle lobe ¼ by ¾ inch, side lobes ½ inch acute straight on inside, with side margin finely toothed. **t. 518.**

Pulneys : in grass.

Gen. Dist. Nilgiri, Pulney and Travancore mountains. Flower. Ootacamund, September.

7. **Habenaria longicalcarata** *A. Rich.; F.B.I.* vi 141, CVI 30 ; Elephant's Head. Distinguished by the large white flowers and very long spur.

Stem 12 to 18 inches, from an oblong tuber. Leaves few (four or five) close to the ground, oblong, acute, or broadly elliptic: stem above clothed with loosely sheathing bracts nearly as long as the internodes. Flowers one to three only: pedicels 1 to $1\frac{1}{2}$ inches: bracts acute, sheathing nearly as long: ovary as long. Petals and dorsal sepal erect: dorsal sepal green, three-nerved, with recurved margins: lateral oblong curved or nearly semi-circular, spreading down and backwards. Lip 1 to $1\frac{1}{4}$ inches, three-fid; midlobe oblong, $\frac{1}{2}$ by $\frac{1}{8}$ inch; lateral lobes cuneate, slightly toothed along the sloping end. Spur 4 to 5 inches, hanging vertically down but bent forwards at about the middle, and thicker below this. Anthers over $\frac{1}{4}$ inch, curved forwards and upwards. Filaments of polliniums over $\frac{1}{5}$ inch: pollen in large granular masses. Stigmas on two large shining fleshy green $\frac{1}{8}$-inch processes, curving horizontally outwards in two semi-circles and nearly meeting in front. **t. 519.** Wight Ic. t. 925. Curtis Bot. Mag. t. 7228.

In t. 519: *a* one caudicle and its gland is shown escaped from the anther-sac, and just the gland of the other.

On the open downs. Pulneys: near Kodaikanal common in places. Widely distributed on the uplands of South India, Mysore, etc., down to 2,000 feet.

8. **Habenaria decipiens** *Wt.; F.B.I.* vi 197. Similar to the last but a smaller plant with much shorter spur and more deeply toothed lateral lobes of the lip.

Shevaroys: Bourne. Also Nilgiris [F.M.P.].

9. **Habenaria elliptica** *Wight, Herb. Wight. Prop.* 3071 *!; F.B.I.* vi 147, CVI 49. Tubers ellipsoid, $\frac{3}{4}$ to $1\frac{1}{4}$ inches: stem 8 to 24 inches, leafy. Leaves mostly near the ground but also on the stem above, lanceolate or elliptic, acute, 2 to 3 inches by $\frac{1}{2}$ to $\frac{3}{4}$ inch; the upper

smaller and merging into the floral bracts, which are lanceolate acute, shorter than the ovary. Racemes dense, many flowered. Flowers white $\frac{1}{2}$ inch across : ovary $\frac{3}{4}$ inch, curved forwards. Dorsal sepal and petals erect, arching over the column : lateral sepals spreading. Lip curled down, divided to near the middle into three nearly equal lobes : lateral lobes acute, entire or dentate on the outer margin. Spur $\frac{3}{4}$ inch, slender above, below much thickened and curved forwards. Stigmatic processes fleshy, deflexed down against the labellum. Scent that of the English "Lily of the valley." **t. 520.** Wight Ic. t. 1706.

On the open grass downs. Pulneys : above Kodaikanal, etc. Not elsewhere.

10. **Habenaria Heyneana** *Lindl.* ; *F.B.I.* vi 148, CVI 53. Stem 6 to 10 inches. Leaves $1\frac{1}{2}$ by $\frac{3}{4}$ inch, ovate, stem-clasping, recurved : upper smaller, acuminate. Raceme 2 to 3 inches. Bracts broad, acuminate, sheathing the flowers. Flowers all facing one way, greenish yellow. Dorsal sepal and petals arching : lateral sepals spreading. Lip three-partite curving downwards : lobes oblong $\frac{1}{5}$ inch, sub-equal or the middle one very slightly longer and broader. Spur as long or shorter than the ovary, which is not stalked. Turns black on drying. **t. 521.**

Nilgiris : on the downs to Pykara ; flowering summer.

Gen. Dist. Western Ghauts.

11. **Habenaria crassifolia** *A. Rich.* ; *F.B.I.* vi 151, CVI 63. Distinguished by the two nearly circular fleshy leaves spreading out flat at the base. Stem $\frac{1}{2}$ to 2 feet, from an oblong ellipsoid tuber 1 to $1\frac{1}{2}$ inches long ;

leafless except at the base, but clothed with sheathing bracts which may overlap towards the top. Leaves two only, 1 to 2 inches, circular, fleshy. Flowering part less than half the whole : bracts lanceolate acute, $\frac{1}{2}$ to $\frac{3}{4}$ inch, shorter than the ovary. Ovary 1 inch, sessile. Flowers $\frac{1}{4}$ inch only, white. Dorsal sepal ovate-acute, arching : lateral sepals $\frac{1}{8}$ inch, oblong-obtuse, curved downwards. Petals shorter and narrower ovate-acute. Lip three-fid, lobes acute, entire or nearly so. Spur nearly as long as the ovary, club-shaped. Stigmatic processes short acute. **t. 522.** Wight Ic. t. 1694.

In damp places flowering June to September. Nilgiris : near Ootacamund, etc. Pulneys : just below Kodaikanal.

Gen. Dist. Western Ghauts northwards to Mahabaleshwar.

Closely allied to H. platyphylla of the plains near Madras.

12. **Habenaria Perrottetiana** *A. Rich. ; F.B.I.* vi 164, CVI 103. Remarkable for its yellow flowers and the very broad sepals and longitudinally folded lip. Stem stout 1 to 2 feet. Leaves 2 to 3 inches long, passing upwards into the bracts. Sepals $\frac{3}{4}$ by $\frac{1}{3}$ inch, obtuse, concave. Petals erect, narrow ; lip triplicate in bud. **t. 523.**

Pulneys : on the downs in grass.

PERISTYLUS. F.B.I. INCD. IN 148 CVI.

Ground orchids similar to HABENARIA and formerly included as a section of that genus, having the lateral sepals erect and forming with the dorsal sepal and the petals a hood over the flower. Spur short. Flowers greenish.

KEY TO THE SPECIES.

a	Lateral lobes of lip filiform	b
	Lip of 3 oblong lobes : flowers in a loose spiral.	P. spiralis.
b	Stem leafy for half its height . . .	P. Richardianus.
	Leaves clustered at one level	P. aristata.

Peristylus Richardianus *Wt.* ; formerly Habenaria bicornuta *Hook. ; F.B.I.* vi 156, CVI 78. *Wight, Herb. Wight Prop.* ! Stem up to 2 feet leafy to about the middle. Leaves 1½ by 12 inches, narrow lanceolate-acute, merging above into the bracts. Spike long, many flowered, bracts ⅓ inch, ovary ½ inch. Flowers ⅙ inch, yellowish-green. Dorsal sepal ⅛ inch, arched like a hood. Lateral sepals as long, obtuse. Petals a little shorter. Lip three-partite. Lateral segments long and linear, curled at first like ram's horns, then erect and curved like a buffalo's ; middle segment ⅛ by 1/12 inch, oblong-obtuse, thick, with three swellings at the base, the middle one curving over the entrance to the spur. Spur ¼ inch, half the ovary. Column about 1/16 inch. Leaves and flowers dry black. **t. 524.** Wight Ic. t. 1097.

In grass Pulneys : Pillar rocks and down to Shembaganur ; flower September. Nilgiris : about 6,000 feet.

Peristylus spiralis *A. Rich. ; F.B.I.* vi 159 (Habenaria torta *Hook. f.*), CVI 87. Slender plants with greenish flower in a loose spiral, distinguished from our others of this genus by the equally three-lobed lip and very short spur. Stem 6 to 10 inches. Leaves in the lowest third, the lowest shortest, the upper pasing into the narrow bracts, the middle leaves about 2 by ⅓ inch narrowly ovate, or lanceolate. Bracts longer than the ½ inch ovary. Sepals

and petals about $\frac{1}{6}$ inch, connivent over the column. Lip longer with 3 oblong equal lobes. Spur one-third as long as the sepals. The flower is bent at the top of the ovary so that the sepals and petals are nearly horizontal, the lip hanging down. **t. 525.**

In grass. Nilgiris : Naduvattam, flower September.

Gen. Dist. Also Travancore and Bababoodon.

Peristylus aristata *Lindl.* ; formerly Habenaria aris *Hook. f.* ; *F.B.I.* vi 158, CVI 82. A slender plant with leaves clustered a few inches above the ground, and loose spike of green flowers distinguished from our others of this genus by the long filiform side lobes of the lip.

Stem 8 to 18 inches. Leaves 3 to 6 together, 2 to 3 by $\frac{1}{2}$ to $\frac{3}{4}$ inch ovate-acute or elliptic, nerved. Stem nearly bare for the next third or more. Upper bracts $\frac{1}{4}$ inch, shorter than the ovary. Sepals and petals $\frac{1}{6}$ inch. Lip three-partite, the side lobes filiform $\frac{3}{4}$ inch, divergent, middle lobe $\frac{1}{8}$ inch. Spur half the ovary, inflated at the bottom. **t. 526.**

Pulneys : in light shade on damp ground near Kodaikanal.

Gen. Dist. Western Ghauts, 7,000 feet.

PLATANTHERA. F.B.I. INCL. in 148, CVI.

Ground orchids similar in general to HABENARIA and included formerly with PERISTYLUS in that genus, but differing in the stigmas not being stalked but more or less confluent.

Species about 80 in the north temperate regions and on tropical mountains. In England the Butterfly orchid belongs to this genus.

Platanthera Susannæ *Lindl.* ; formerly Habenaria Susannæ Br. ; *F.B.I.* vi 137, CVI 15. A robust plant of 2 to 4 feet. Leaves ovate-oblong 2 to 6 inches long,

clasping the stem at the base and erect, covering the stem up to the spike. Bracts leafy. Flowers few 2 to 3 inches across, white, fragrant. Side lobes of lip over 1 inch divided deeply into narrow segments. Spur 5 to 6 inches. t. **527**. Wight Ic. t. 920.

Pulneys, 4,000 to 5,000 feet.

Gen. Dist. Western Ghauts, 4,000 feet. Tropical Himalayas to Travancore, Malaya Islands and China.

PHYLLOMPHAX. F.B.I. INCL. IN 148 CVI.

Ground orchids similar in general to HABENARIA and formerly included in that genus, but differing in the stigmas not stalked, and from PLATANTHERA in the lip being entire.

Phyllomphax obcordate *Schltr.*; formerly Habenaria obcordata; Platanthera obc. *Lindl.*; Habenaria galendra *Benth.* and Habenaria jantha *Benth.*; *F.B.I.* vi 163 and 164, CVI 100 and 101. Common purple ground-orchid. Stem 6 to 10 inches, leafy throughout, glabrous, green but purplish at the base. Leaves ovate-acute, stem clasping, 1 to 2 by $\frac{3}{4}$ to 1 inch, merging upwards into bracts. Bracts leaf-like, longer than the ovary. Sepals and petals erect, arching over the column. Spur short and broad, sac-like. Very variable in size and in the size and shape of the lip, which may be from $\frac{1}{3}$ to 1 inch, and from cuspidate to deeply notched. **t. 528.**

var. **jantha** *Hooker ms. on Herb. Wight Prop.* 1031 *! ; not of Wight.* Lip larger, up to 1 inch across, and longer, deeply notched with or without a central point, but not cuspidate. Stem dark purplish-red. Leaves green with red nerves. t. 528. (*b.* fruit.)

Pulneys: Kodaikanal downs. Travancore (*Wight Kew Dist.* 3025). Grows with the other on the Kodaikanal downs with intermediate forms.

SATYRIUM. F.B.I. 148 CIX.

Twin-spur.

Ground orchids allied to HABENARIA (q.v.) and distinguished by having two spurs hanging down on either side from the lip which is on the upper or posterior side of the flower, because the ovary is not (as is usual) twisted. Polliniums therefore with their stalks pointing upwards.

Species 10 in south and tropical Africa, Madagascar.

Satyrium neilgherrensis *Wt.*; formerly S. nepalense *Don.*; *F.B.I.* vi 168, CIX 1; Pink Twin-spur. Stem up to 2½ feet. Basal leaves very large, up to 5 or even 7 inches by 3 to 4 inches, broadly ovate with sheathing base; upper leaves smaller. Spike very dense: bracts longer than the ovary, lanceolate. Flowers pink or white: posterior lateral sepals reflexed: anterior odd sepal (in most orchids posterior) narrow, curved down in front between the similar but broader petals. Lip erect curved as a hood over the column; spurs slender, ½ inch. Column curved forwards with two minute lobes on either side. Anther sacs nearly globular. Stigma above them. **t. 529.** Wight Ic. t. 1716.

Nilgiris: on the downs abundant after the summer rains. Pulneys: near Kodaikanal and on the downs.

Gen. Dist. Widely distributed on the mountains of India, Burma and the Malay Peninsula.

F.M.P. describes the plant as having several not well-defined varieties. On the Nilgiris in Ootacamund on Church Hill and elsewhere the white-flowered form differs from the pink in the smaller flowers with less spreading sepals (the spikes ½ to ¾ inch thick only, not 1½ inches) and the bracts broader and shorter.

DISPERIS. F.B.I. 148 CX.

Ground orchids with purplish flowers akin to HABENARIA (q.v.) but with the posterior sepal and petals united as a small rounded hood from beneath which project two spreading sepals. Column very small, and covered by the small labellum which has three arms, one curled underneath, the other two spreading like two curved horns under the hood. Behind the labellum is a membrane on which lie the stigmas, and which is extended laterally in two narrow ribbons which are curled under and forward at the ends, and cover the base of the anther.

Species 20 in Africa and two in South India.

Front (lateral) sepals divergent twisted . . D. neilgherrensis.
Front (lateral) sepals concave not twisted . D. zeylanica.

Disperis neilgherrensis *Wight; F.B.I.* iv 160, CX 2. Stem about 6 (2 to 12) inches, leaves few, ¾ to 1 inch, broadly ovate, stem-clasping. Stem above with sheaths. Flowers white or reddish spotted with crimson: hood ¼ inch. Lateral sepals ½ inch. Projecting arms of the lip papillose, curved back. **t. 530**. Wight Ic. t. 1719.

Nilgiris: near Ootacamund: Pulneys: in sholas. Shevaroys: under hedges, etc.

Gen. Dist. Mysore and South India generally.

Disperis zeylanica *Trimen; F.B.I.* vi 169, CX 1. A smaller plant than the next. Lateral sepals concave not waved. **t. 531**.

Pulneys: in grass on the open downs.

In F.M.P. this species is included in D. neilgherrensis *Wt.*, but the plants growing on the Pulneys certainly seem distinct; Wight's figures show the difference as do also ours. The species differ also in habitat.

ZINGIBERACEÆ.

In *Gen. Plant.* and *F.B.I.* a tribe of the SCITAMINÆ.

Herbs with perennial rootstock and stalked leaves arranged in two ranks with sheathing bases and at the junction of blade and stalk a small thin flap (*ligule*). Flowers in racemes, heads or cymes, in the axils of leafy bracts, and sheathed by tubular bracteoles. Sepals three, united at the base. Petals three, separate. Stamen one, at the back of the flower, with a large anther between the two lobes of which lies the style: behind this two petaloid staminodes: in front a two-lobed or bifid lip (often the most conspicuous part of the flower) composed of two staminodes. Ovary inferior, three-celled: style slender. Fruit a loculicidal capsule. Seeds with perisperm.

Species 275 in the tropics mostly of India and the Malay regions. Commonly cultivated genera are ZINGIBER Ginger, CURCUMA Turmeric, ELETTARIA Cardamom.

The family (or tribe) is closely allied to the CANNA of our gardens but differs in having a completely two-celled anther, and the lip being symmetrically placed opposite it and being composed of two staminodes.

CURCUMA. F.B.I. 149 VI.

Turmeric, etc.

Herbs with tuberous rootstock but no leafy stem above ground. Leaves radical, oblong, often large. Flowers several together in the axils of large bracts, arranged in a dense raceme which ends in coloured empty bracts. Calyx tube short. Corolla tube funnel-shaped, the upper (posterior) petal larger and more concave. Filament of stamen united to the two large posterior staminodes. Cells of the anther spurred at

the base. Lip roundish. Capsule globose, three-celled. Seeds usually with aril.

Species about 50, mostly in tropical Asia but also Africa and Australia.

Curcuma neilgherrensis *Wight, Herb. Wight Prop.!* ; *F.B.I.* vi 210, VI 2. Rootstock tuberous, clothed with thin brown scales, the new tubers lateral. Leaves not visible at time of flowering, many-nerved.

Flowering stem 4 to 7 inches sheathed below by the undeveloped leaves, and with a few bracts below the spike. Bracts about 1 inch by ⅓ inch, thin, concave, many-nerved, white tinged more or less with pink especially at the top. Flowers sessile, in threes in the lower bracts, solitary in the upper. Calyx tubular, ⅓ inch, unequally three-lobed. Petals 1 inch, connate half way, very thin, with about five reddish veins. Staminodes lemon yellow, the most conspicuous part of the flower, but scarcely exceeding the petals ; the two upper oblanceolate obtuse, erect and curved backwards, two lower one forming the deeply bifid lip. Stamen three-fourths the length of the upper staminodes and attached to the staminodal tube at the same level as them ; anther about ⅛ inch, with a small yellow crest at the top and two short lateral spurs at the base. Style very slender, curved against the flower-tube : stigma round hollowed. Ovary three-celled, seeds in two rows in each cell, axile. **t. 532.** Wight Ic. t. 2006.

Nilgiris : on the lower downs. Pykara near the river at 6,600 feet. Biccapatti on damp hill sides ; flowering early in May.

Gen. Dist. Western Ghauts, especially the south-west slopes of the Nilgiris.

Wight's specimen has large leaves, but most of those at Kew have no leaves with the flower, as I found.

In t. 532 : above flower and sect. of ovary ; below anther from in front and the side, surrounding the style and stigma.

HEDYCHIUM. F.B.I. 149 X.

Large leafy plants with the characteristics of the family (q.v.). Flower in dense spikes with rather broad lateral staminodes. Distinguished from CURCUMA in the filament and connexion of the stamen being long and slender and not crested.

Species 30 in Asia and Madagascar.

Hedychium coronarium *Koen.* ; *F.B.I.* vi 225, XI. Leaves about 16 by 3 inches. Spike about 5 inches. Bracts 2 to 3 inches by $\frac{1}{4}$ inch. Calyx tubular $1\frac{1}{2}$ inches with fine teeth. Corolla little slender $2\frac{1}{2}$ to 4 inches. Petals slender. Staminodes about $\frac{1}{3}$ inch wide : lip obcordate 2 by $\frac{3}{4}$ inch. **t. 533.**

In damp places. Pulneys : below " Prospect Pt.", etc.

In Vol. III of my Fl.N. and P. Hts. *the name of this species was given* as H. chrysoleucum *Hook*, with reference to a note in the Kew Bull of 1914. In the F.M.P. since published the former name (coronarium) is retained.

HÆMODORACEÆ.

A small family very similar to the LILIACEÆ but differing in the petals and sepals being joined at the base into a perianth tube, the ovary and fruit being more or less inferior, and the embryo not surrounded by endosperm but intruded into it.

Several genera including the one here are by some placed in the LILIACEÆ.

OPHIOPOGON. F.B.I. 150 III.

Herbs with stout perennial rhizome, narrow radical leaves and leafless flower-stem. Ovary inferior. Sepals and petals free above it, spreading widely. Stamens six, attached to the base of the sepals and petals, and shorter than them. Anthers linear, longer than their filaments, opening at the sides.

Species 4 in India, Eastern Asia and Japan.

Ophiopogon intermedius *Don ; F.B.I.* vi 269, III 5 ; " Lily of the wood." Leaves all from the rootstock narrow and grass-like. Flowering stem up to 15 inches : flowers pendulous in a loose raceme : pedicel and flower white. Bracts $\frac{1}{4}$ inch. Pedicel $\frac{1}{3}$ inch. Corolla $\frac{1}{2}$ inch. Anther green. Ovary deeply six-lobed. Style grooved. **t. 534.**

On the outskirts of our area. Nilgiris : Kotagiri. Pulneys : below Kodaikanal, Shembaganur, etc., rare above. Shevaroys : common in June.

Gen. Dist. Himalayas, Khasia and West Coast hills.

The species was founded on the Nepal plant from which ours appears to me indistinguishable.

AMARYLLIDACEÆ.

Herbs with perennial rootstock or bulb, mostly radical leaves, and usually perfectly regular flowers with three sepals and three petals (or six similar parts), six stamens, an inferior ovary of three cells each with many seeds, and dry capsular fruit. Very similar therefore to the LILIACEÆ except in the inferior ovary, and also that the flowers are usually umbelled and in bud enclosed in a large, thin, or scarious bract (*spathe*) (sometimes one flower only to the bract).

Genera 64. Species 700.

Common garden plants on the plains : CRINUM and PANCRATIUM (White Lilies), EUCHARIS. In England and on these hills : Amaryllis, Narcissus, Daffodil, Snowdrop, AGABANTHUS, etc.

KEY TO OUR GENERA.

a	Rootstock tuberous : flowers racemose	*b*
	Rootstock a bulb : flowers in umbels	*d*
b	Leaves grass-like, flower ½ in., solitary . . .	HYPOXIS.
	Leaves lanceolate, ribbed and hairy	*c*
c	Sepals and petals carried on a long stalk above the ovary.	CURCULIGO.
	No long stalk above ovary	MOLINERIA.
d	Flower solitary : leaves grass-like . . .	ZEPHYRANTHES.
	Flowers umbelled : leaves broad	CRINUM.

HYPOXIS.

Small plants with globose tuber and narrow leaves all from the ground. Flowers of the normal type for the order, the perianth immediately above the ovary.

Species about 50, chiefly in South Africa.

Hypoxis aurea *Lour.* ; *F.B.I.* v 277, I I. Leaves linear, 4 to 6 inches, hairy. Flowers yellow, solitary, on slender stalks half as long as the leaves. Ovary ¼ inch. Sepals and petals ¼ inch. Anthers sagittate. Capsule ¼ inch to ⅓ inch. **t. 535.**

Pulneys : In damp places on the downs. Nilgiris, Coonoor.

Gen. Dist. From Kashmir to South India, Java, China, Japan.

CURCULIGO. F.B.I. 152 II.

Small herbs with tuberous rootstock and star-shaped flowers close down among the narrow plaited leaves, and remarkable for the sepals, petals, stamens and style being carried up on a long solid stalk above the ovary. Stamens

short : anthers linear, fixed by the back. Style short : stigmas three, erect, stout. Fruit more or less beaked, indehiscent.

Species about 12 in the tropics.

Ovary not visible above ground : solid stalk of perianth above it long : leaves glabrous . . . . C. orchioides.
Flowers racemed. Stalk of perianth short, ovary therefore visible : leaves villous . . . . Finlaysoniana.

The long thick roots show transverse wrinkling. This is due to a contraction by which the plant is pulled deeper into the ground each year as the rootstock grows in height, so that the leaves are kept at the ground level.

Curculigo orchioides *Gœrtn. ; F.B.I.* vi 279, II 5 ; Yellow Ground Star. Rhizome stout, vertical : roots thick wrinkled. Dead leaves very fibrous. Leaves 3 to 4 by $\frac{1}{2}$ to $\frac{3}{4}$ inch, linear elliptic or lanceolate, deeply ribbed and folded, with long-scattered hairs. Flowers $\frac{1}{2}$ to $\frac{3}{4}$ inch across, yellow, close down among the leaves ; ovary underground, small. Solid stalk of perianth long, slender. Capsule $\frac{1}{2}$ inch, oblong one to four-seeded, with slender beak. Seeds " $\frac{1}{8}$ inch, deeply grooved in wavy lines, black, shining." Upper flowers male, with stamens only. **t. 536.** Wight Ic. t. 2043.

In damp places. Pulneys at Kodaikanal in Tinnevelly, marsh, etc.*

Gen. Dist. Sub-tropical Himalayas, Khasi Hills, Western Ghauts Java, Philliphine (in these last two areas with glabrous leaves).

MOLINERIA.

Similar to CURCULIGO and previously included in that genus, but separated because the stalk above the ovary is quite short.

Curculigo Finlaysoniana *Wall ; F.B.I.* vi 279, II 4. Leaves villous. Flowers in lax racemes, well above the

ground. Solid stalk of perianth short ; ovary therefore close below the sepals and petals. Upper flowers male only. Pedicels in fruit 1½ inches.

Pulneys : Bear-shola and on slopes below Kodaikanal.

Gen. Dist. Also Ceylon.

ZEPHYRANTHES. 142 11.*

Bulbous herbs with tall leafless flowering stem (scape) bearing one flower in the axil of a spathe. Perianth funnel-shaped with short tube. Capsule sub-globose or depressed three-lobed, loculicidally three-valved. Seeds oblong, black.

Species about 30 in the warmer parts of America from Bolivia to Texas and Mexico, one also in western tropical Africa. Several are cultivated and thus spread all over the world.

Zephyranthes carinata *Herb.* ; II* 2. " Pink Lily." Scape about 12 inches. Leaves narrow, as long. Flowers 2½ inches. Spathe 1½ inches, split open about one-third. **t. 537.**

Nilgiris : Ootacamund, Coonoor, etc. ; common on road-sides as a garden escape.

Z. tubispatha *Herb.* ; II* 1. A smaller plant with spathe split on both sides is common in gardens, and also apparently naturalized, on the plains.

DIOSCOREÆ.

Climbing plants with alternate or opposite, simple or digitately compound leaves and axillary panicles of small unisexual often diœcious, flowers. Parts of the flower in 3's. Ovary inferior, fruit in DIOSCOREA (the chief genus) a winged capsule.

Genera 9. Species about 220.

DIOSCOREA.

Characters as above. Species about 200.

KEY TO THE GENERA.

Leaves simple opposite or mostly so . . D. oppositifolia.
Leaves of 5 to 7 large leaflets. . . . . D. kalkapershadii.

Dioscorea oppositifolia *Linn.* ; *F.B.I.* vi 291, I 13. Leaves mostly opposite, on a stout petiole of $\frac{1}{2}$ to 1 inch, ovate oblong or nearly round, strongly 3 to 5 veined from the base, and with a thickened margin. Male panicles 2 to 5 inches, the spikes 1 inch racemed : female as long simple. Capsule $\frac{3}{4}$ consisting almost entirely of the 3 wide wings.

Shevaroys : common. Nilgiri and Pulney hills only at low levels.

Dioscorea Kalkapershadii. A climber with 3 to 7 pinnately veined leaflets. Petioles up to 10 inches. Leaflets to 10 by 4 inches, pubescent below. Spikes of male flowers long, together at the nodes 2 or 3 on long racemes.

Shevaroys : (Perrottet) Not seen.

LILIACEÆ.

Herbaceous or woody plants with underground rhizome tuber or bulb, and leaves of various kinds. Flowers quite regular, with all parts in threes : three sepals, three petals (sometimes all six alike), six stamens opposite these, and a superior ovary of three cells, each with many seeds.

A very large family of about 200 genera and 2,500 to 3,000 species, in all climates and countries. Nearly allied to the AMARYLLIDACEÆ (q.v.) from which it differs chiefly in the ovary being superior.

The family is divided into e even main sections arranged according to the nature of the fruit and the underground tuber or bulb, and includes among garden plants, the Tulip, Hyacinth, Onion, Alœ, and Funkia, in all of which the fruit is a dry capsule ; and the Lily of the Valley, Solomon's Seal and Asparagus with berries.

Climbers with heart-shaped leaves . . . . SMILAX.
Stems green, branches slender needle-like . . ASPARAGUS.
Small herb : flowers in irregular racemes . CHLOROPHYTUM.
Stem 2 feet leafy : flowers solitary, large . . . . LILIUM.
Stem branched, leafy : flowers pendulous . . . DISPORUM.

SMILAX.

Thin-stemmed, climbing plant often with small (or when old formidable) prickles. Leaves alternate, with short stalk, its base broadened at the attachment to the stem and prolonged often as tendrils : the blade ovate or nearly circular, rounded acute or cordate at the base : strongly 3 to 5 or 7 veined (but without the margined thickening of DIOSCOREA). Flowers in globose umbels, unisexual, usually $\frac{1}{8}$ to $\frac{1}{4}$ inch, greenish. Sepals and petals oblong. Male with 6 stamens, female with 3 staminodes and ovary of 3 cells, with 3 stigmas. The umbels disposed one or two on a simple or brown peduncle, or many at the angles zigzag, leafless branches. Fruit a berry of 1 to 4 seeds.

Species about 200 in all parts of the world (Sarsaparilla, Prickly Ivy. *Fr.* Clariege ; *Ger.* Steckwinde).

The garden "Smilax," is really a RUSCUS and more nearly allied to ASPARAGUS.

a { Umbels sessile on axillary leafless branches. Leaves triangular heart-shaped, acute . . . . S. aspera.
Umbels stalked : leaves ovate or rounded, cuspidate. }

b { Umbels many on at the angles of a zigzag peduncle . . S. prolifera.
Umbels 1 or 2 on axillary simple or forked peduncle . *c* }

c	Leaves as broad nearly as long : berry globose . . .	*e*
	Leaves oblong ovate : berry sub-globose .	S. zeylanica.
d	Petiole $\frac{3}{4}$ inch ; Pedicels short, so umbels tight	S. Wightii.
	Petiole 1 to $1\frac{1}{2}$ inches ; umbels loose .	S. macrophylla.

Smilax aspera *Linn.*, *F.B.I.* vi 306, I 12. Stem prickly (or not), as also the leaf-stalks and veins underneath. Leaves blotched, five to nine-veined, ovate deltoid or lanceolate, with rounded-cordate or hastate base. Stalk $\frac{1}{2}$ to 1 inch. Flowers in small, umbels sessile in slender axillary and terminal spikes of 2 to 6 inches. Bracts $\frac{1}{4}$ inch : bracteoles minute. Flowers white, sweet-scented ; buds longer than their pedicels : male sepals $\frac{1}{6}$ inch, female smaller. Berry $\frac{1}{4}$ to $\frac{1}{3}$ inch, red at first, turning black or blue . **t. 538.** Wight Ic. t. 2059.

Nilgiris : Ootacamund and below, flowering January. More frequent at lower levels, Pykara, Karteri, Kotagiri, Coonoor, Pulneys : not on the Kodaikanal downs, but below at level of Shembaganur, etc.

Gen. Dist. Throughout India, from Kashmir to Khasia, Travancore, etc.

Smilax zeylanica *Linn.* ; *F.B.I.* vi 309, I 24. Leaves 5 by 3 inches ovate with small point : fairly uniform in size and shape : petiole $\frac{1}{2}$ inch, with small sheath. Veins 3 and an outer fainter pair at the base. Umbels axillary on a stout simple peduncle with a pair of small bracts near its base. Pedicels $\frac{1}{3}$ to $\frac{1}{2}$ inch, very slender in flower. Petals narrower than the sepals. Styles in the female nearly as long. Berry sub-globose or ovoid : when young oval. **t. 539.**

Shevaroys : in light Sholas on the Green Hills plateau : flowers in winter months : fruit summer.

I identify my Shevaroy plant as this species because it is the only one I have seen with berries not globular, and Trimen who must certainly have had the species named " zeylanica " by Linnæus, described the berries as

sub-globose (Hd. Bk. Flr. Ceyl., p. 283). In dried specimens it is not evident that the berries are not globose, and this presumably is why this very distinctive character was missed by J. D. Hooker in the F.B.I. and by C. E. C. Fischer in the Fl. Mad. Pr.

Smilax macrophylla *Roxb* ; *F.B.I.* vi 310, I 25. A stout climber, $\frac{1}{2}$ to $\frac{3}{4}$ inch thick with stout thorns on the older parts. Leaves broadly ovate or nearly circular, with a short cuspidate point, and cuneate rounded or sub-cordate base : with 5 or 7 veins. Petiole very stout, 1 to $1\frac{1}{4}$ inches, sheath narrow a third only as long. Umbels 2 or 3. Main peduncle about $\frac{1}{3}$ inch and secondary about $\frac{1}{2}$ inch. Pedicels slender $\frac{1}{3}$ inch (flowers not crowded), buds shorter. Petals narrower than the sepals. Berries $\frac{1}{3}$ inch, perfectly globular. **t. 540.**

Nilgiris : Coonoor, Kotagiri, flower autumn.

The young leaves are pink and have the edges rolled back, exposing the upper side.

Smilax Wightii *A.D.* ; *F.B.I.* vi 310, I 26. Similar to the last and perhaps really the same, but the petioles shorter, with sheath half its length, the heads of flower dense (berries touching), and petals equal to the sepals in width. **t. 541.**

Shevaroys : flower June, common. Nilgiris [*F.B.I.*].

Fischer in F.M.P. writes both these with S. zeylanica *Linn* : but they are certainly distinct from the plant here identified as S. zeylanica. Though not easily separated from each when dried, they appear also when fresh different from each other. I therefore follow De Candolle and J. D. Hooker in keeping them separate.

Smilax prolifera *Roxb.* ; *F.B.I.* vi 312, I 30. A very stout lofty climber, similar to the preceding but the umbels many at the angles of a zigzag peduncle, forming large axillary panicles up to 8 inches long. Secondary peduncles $\frac{1}{2}$ to 1 inch. Pedicels $\frac{1}{2}$ inch. Sepals thick with incurved

point. Petals thinner and narrower, obtuse, flat. Leaves ovate or nearly orbicular. Petiole 1 inch stout: sheath half as long. **t. 542.**

Shevaroys: Green Hills flowering early June.

Pulneys: Pambar stream, Kodaikanal (*Bourne*).

ASPARAGUS. F.B.I. 156 III.

Asparagus.

Herbs with stout creeping rootstock, and slender ribbed or grooved green stems, with no true leaves, but the latter reduced to small, sometimes spine-tipped, scales subtending a bunch of narrow green needle-like spiny or flattened branchlets (*cladodes*). Flowers small, with jointed stalks, in the axils of scales: of the type usual in this family. Fruit a globose berry, enclosing two to six seeds with black brittle testa.

Species about 100, in the Old World, both temperate and tropical, mostly in dry places.

The spine is really a short branch (*a*) arising in the axil of the thin scale (1) but breaks through this as it develops, as will be seen on examining the youngest parts. At the back of the branch is another thin scale; (2) this is really a leaf on the spine, and in its axil the branch (*b*) is developed. Round the base of each short flower-stalk (*c*) are three small scales, the one to the outside (3) being the bract of the flower, the other two (4) the bracteoles.

KEY TO THE SPECIES.

Flowers solitary or few . . . . A. Fysoni.
Flowers in racemes . . . . A. laevissimus.

Asparagus *Steudel; F.B.I.* vi 315, III 6. Stem erect, tall, smooth, with straight thorns, above each of which is a small scale, and a branch. Cladodes six to twelve together, $\frac{1}{6}$ to $\frac{1}{3}$ inch long, angled, stiff. Flowers

solitary, one on each side of a branch on short stalks which are jointed above the middle. Berry $\frac{1}{3}$ inch. t. 543. Wight. Ic. t. 2053 (A. asiaticus).

On the Nilgiri and Pulney downs. Peculiar to these hills.

A. subulatus is a South African species.

Asparagus lævissimus *Steud.; F.B.I.* vi 317, III 12. Cladodes 6 to 8 at a node. Flowers in racemes about $1\frac{1}{2}$ inches long. Pedicels $\frac{1}{6}$ inch jointed at the middle.

Nilgiris: Kotagiri.

Closely allied to A. racemosus of the plains.

CHLOROPHYTUM.

Asphodel.

Herbs with short rhizome (not bulb) with fibrous sometimes fleshy roots, crowded radical leaves and bunches of flowers in leafless racemes. Sepals and petals three to seven nerved, spreading out flat like a star, and persistent after withering. More especially distinguished from other genera by each cell of the ovary having two ovules and the capsule being three-angled with flat sides.

Species about 40 in tropical and sub-tropical regions.

The true Asphodel of Europe differs in the flowers being one to each bract of the raceme, not a bunch of two or more as here.

KEY TO THE SPECIES.

Filaments longer than anthers, smooth . . C. malabaricum.
Filaments shorter than anthers, papillose . C. attenuatum.

Chlorophytum malabaricum *Baker, Lour on Bababoodons!; F.B.I.* vi 335, XV 8; White Asphodel. A small herb with short stem clothed with the bases of the leaves, and thick white roots. Leaves about 4 inches (up to 12 inches), all from the ground, lanceolate, acute, usually folded along the middle line, but without midrib,

many-nerved, glabrous and bluish, curved. Flowers usually in pairs, one opening much before the other, in the axils of bracts, racemed in a short spike, on a scape shorter than the leaves. Bract $\frac{1}{2}$ inch, acuminate, three-nerved, thin, longer than the pedicel. Pedicel shorter than the bract, not jointed. Flowers star-shaped, $\frac{5}{8}$ inch across ; sepals $\frac{1}{3}$ inch, broadest above the middle, with midrib greenish and raised into a slight keel at the end. Petals similar, quite white. Filaments two-thirds as long, white, glabrous, stiff, thinner just below the anther : anther $\frac{1}{16}$ inch, yellow, attached very near the base. Style thickest about the middle, thinner above : stigma terminal, punctate. **t. 544.**

Common on grass. Nilgiris : on the Western plateau at Pykara, flowering May.

Gen. Dist. Western Ghauts from Kanara southwards.

F.B.I. describes pedicels jointed above the middle. I don't find them so.

Chlorophytum attenuatum *Baker. ; F.B.I.* 335, XV 7. Leaves 8 to 18 inches not curved. Scape as long or longer. Spike open, the nodes well separated. Pedicels jointed at the middle. Filaments of stamens papillose : anthers longer.

Nilgiris : on the Eastern plateau, Kodanad, Kotagiri.

LILIUM. F.B.I. 156 XXI.

True Lily.

Bulbous plants, with erect more or less leafy stem. Flowers few, at the end of the stem, large, pendulous or horizontal, bell-shaped. Anthers attached by their backs, versatile. Fruit a loculicidal capsule.

Species 45, all in north temperate countries. The common White Lily of gardens on the plains of India is a CRINUM (family AMARYLLIDACEÆ).

Lilium neilgherrense *Wight ; F.B.I.* vi 350, XXI 3 ; the Nilgiri Lily. Stem 1½ to 3 feet. Leaves 2 by ½ inch, narrow-lanceolate acute, three-nerved. Flowers solitary, 6 by 4 inches, bell-shaped, horizontal. **t. 545.**

Common on the open downs of the Nilgiri and Pulney Hills ; flowering July to October.

Peculiar to South India, not northwards in the Bombay Presidency.

The bulbs should not be moved while the plant is in flower, nor until the leaves have died down, and if it is desired to plant them elsewhere a stake should be put to make the place, and the bulb dug up later. Lily bulbs are delicate movers and this species will not grow in the plains.

DISPORUM. F.B.I. 156 XXXII.

Herbs with creeping rhizome and erect branched leafy stems, clothed below only with sheathing scales. Leaves sessile or shortly stalked not stem-clasping, net-veined between the many nerves. Flowers solitary or in pairs, narrow bell-shaped, pendulous, soon falling. Sepals and petals not connected, sometimes saccate at the base. Anthers opening outwards. Fruit a berry.

Species 12, in North America and mountains in the tropics of Asia ; one or two in Japan.

Disporum Leschenaultianum *Don.* 3 *! ; F.B.I.* vi 360, XXXII 3 ; Nilgiri Solomon's seal. Stem up to 4 feet, ⅓ inch thick at the base, tinged purple : clothed for a couple of inches or more above the nodes by the persistent sheathing scales. Upper, leafy part, repeatedly forked, with divergence of about half a right angle. Leaves broadly ovate, acuminate, 2 by 2 inches, quite glabrous, thin, glossy : nerves about seven, curving from base to apex, deeply indented above. Flowers drooping on stiff decurved pedicels, solitary in the upper leaf-axils or bunched. Sepals and petals ⅛ to ⅝ inch, elliptic, acute strongly keeled. Stamens six erect : filaments ⅙ inch stiff : anthers ⅛ inch. Style longer : stigmatic branches

three, $\frac{1}{6}$ inch. Berry dark blue, $\frac{1}{2}$ inch, very slightly three-lobed. **t. 546.** Wight Ic. tt. 2048, 2049.

Sholas, common on the Kodaikanal and Ootacamund downs.

var. angustifolium. Leaves linear-lanceolate scabrid on veins of lower side—Coonoor [F.M.P.].

Gen. Dist. Also Ceylon. Rare in the Bombay Presidency.

The flowers face downwards and must therefore be visited from below. A pocket is formed between each stamen and the keeled or saccate base of the sepal or petal opposite it, and in this honey may be secreted. A proboscis inserted here could not fail to touch the anthers, and be dusted by pollen, since they open outwards and the filaments are very stiff.

The true Solomon's Seal of Europe (*Ger.* Weisswurz) is a POLYGONATUM, a nearly allied genus.

IPHIGENIA.

Small herbs with globose rootstock (corm) covered with brown scales. Flowers reddish to dark purple. Stamens opening outwards. Capsule loculicidal.

Species few, in India, Africa and Australia.

Iphigenia indica *Kunth.* Corm $\frac{1}{2}$ to $\frac{3}{4}$ inch diameter. Stem slender 2 to 24 inches, leafy up to the flowers. Leaves linear, 3 to 4 inches only. Perianth parts $\frac{1}{4}$ to $\frac{1}{2}$ inch very narrowed, dark purple. Capsule $\frac{1}{2}$ inch long, but variable in size. **t. 547.**

In grass. Nilgiris: on Coonoor hills, Kotagiri.

Gen. Dist. Throughout India from the North-Western Frontier to Burma and Ceylon, Australia, Philippines.

EUCOMIS.

Herbs with bulb and spike of flowers, crowned by a tuft of bracts.

Species about 5, all South African.

Eucomis undulata *Willd.* Obviously a garden escape, but apparently naturalized in Neutral Saddle on the Pulneys, 5,300 feet. **t. 548.**

XYRIDACEÆ.

A small family of about 50 species mostly belonging to one genus.

XYRIS. F.B.I. 159 I.

Tufted herbs with stiff radical leaves and slender leafless flowering-stems (scapes) ending in a small cone of brown bracts from among which arise one at a time, yellow flowers with three small scarious sepals, three petals with erect claws and spreading blades, three stamens opposite to the petals, three staminodes alternating with them and a three-celled superior ovary ripening into a capsule with many seeds.

Species 40 or less, in the warmer parts of the world especially of South and North America, but absent from Europe. India has seven.

Named from the Greek XYRIS, *sharp, because of the stiff narrow leaves.*

Xyris schœnoides *Mart.; Wall. Cat.* 6084 *!; F.B.I.* vi 365, I 5. Leaves narrow, 2 to 9 inches long. Scape much longer, striate. Heads globose or ovoid. Petals yellow, thick papery, crinkled $\frac{1}{4}$ inch. Staminodes hairy. Seeds numerous, egg-shaped, longitudinally ribbed, with minute embryo at the further end from the placenta, the radicle pointing outwards. **t. 549.**

Very common in marshes on all three hills.

COMMELINACEÆ.

Herbs with usually zigzag stems and alternate entire leaves having large sheathing bases and parallel nerves. Flowers variously arranged, more or less irregular. Sepals three green. Petals three, free or united into a tube at the base, spreading, persistent after fading. Stamens six, all perfect or two or more sterile as staminodes; filaments often bearded with long hairs. Ovary

superior, typically three-celled, but often with one cell aborted or not as fertile as the others. Style terminal, stigma small. Fruit a loculicidal capsule or indehiscent. Seeds angled.

Species 300 in tropical and sub-tropical regions.

COMMELINA. F.B.I. 160 II.

Stem slightly zigzag or straight, nearly always weak and decumbent. Flowers several together in small scorpioid (curved) cymes sheathed in a comparatively large heart-shaped bract (*spathe*), folded almost flat along the midrib. Stamens three only fertile, two or three sterile. Ovary of two cells, or with a third imperfect cell. Flower in all our species blue.

Species 100 in tropics and sub-tropics.

For recognition of the several species it is necessary to examine the young fruit. One will almost always be found in a spathe.

KEY TO THE SPECIES.

a { Fertile cells of ovary two, each 2-seeded (sides flat) . . . *b*
Two cells 2-seeded, the posterior 1-seeded keeled (one side not flat) . . . . 1. C. salicifolia.
Fruit 1-celled with one seed only, not keeled . . . . *c*

b { Leaves 5 by 1 inch or more. Plant erect, 2 feet . . . 5. C. coelestis.
Leaves $\frac{1}{4}$ to $\frac{1}{2}$ inch wide . . . . 4. C. clavata.

c { Plant glabrous . . . . 2. C. glabra.
Plant hairy . . . . 3. C. hirsuta.

1. **Commelina salicifolia** *Roxb.*; *F.B.I.* vi 370, II 4. Stem slender, diffuse, with long internodes. Leaves about 3 inches by $\frac{1}{2}$ inch, lanceolate. Peduncle of cyme 1 inch. Fruit short (one-celled) posterior cell keeled.

Pulneys: about Kodaikanal and down to the plains.

Shevaroys:

Roxburgh (Fl. Ind.) described the cells as three each with two seeds, presumably in error.

2. **Commelina hirsuta** *Clarke; F.B.I.* vi 371, II 7. Leaves narrow, 2½ to 3 by ⅓ to ⅙ inch. Peduncles nearly 2 inches. Capsule with one cell fertile, other two cells empty and falling off. **t. 550.** Wight Ic. t. 2067.

Pulneys: on the higher downs. Nilgiris at Naduvattam.

3. **Commelina glabra** *Clarke; F.B.I.* vi 371, II 8. Very similar to the above, but glabrous, and grows with it in the grass of the downs. Wight Ic. t. 2067.

Pulneys: 7,500 feet. Nilgiris, Naduvattam.

The identifications of my plants quoted in these last two species were kindly made for me by Mr. C. C. Calder. Wight first described these as a distinct genus HETEROCARPUS, having in addition to the special fruit, yellow or orange flowers; and plants at lower levels, identical in every other respect have flowers so coloured. It looks as if we have here one species with two allelomorphic forms, a glabrous and hairy, and which in addition varies in the colour of its flowers according to altitude.

4. **Commelina clavata** *Clarke; F.B.I.* vi 371, II 10. Stem slender. Sheaths of leaves 1 inch, strongly ciliate. Leaves 1½ to 2½ inches by ¼ inch, contracted at the base. Stalk of cyme 1½ inches, slender. Spathe 1¼ inches by ¾ inch (when opened out flat). Capsule four-angled, shortly oblong, of two cells each with two seeds. **t. 551.**

Pulneys: on the downs above Kodaikanal.

5. **Commelina coelestis** *Willd.; F.B.I.* vi 369, II 21. Stem 2 feet erect. Leaves 5 to 6 by 1 inch at base: sheath 1 inch wide with ciliate mouth. Spathe 1½ inches acuminate, ¾ inch at widest point when folded (1½ inches when open). Flowers deep blue very large. **t. 552.**

A native of Mexico. Cultivated in gardens and occurring in Ootacamund and Kodaikanal as a garden-escape by roadsides in rich shaded ground.

For fertilization see Koerner Nat. Hist. of Plants, Vol. ii, p. 357.

ANEILEMA. F.B.I. 160 III.

Stem simple or branched: roots often tuberous. Flowers in axillary or terminal panicles with small bract and bracteoles. Sepals three, membranous. Petals three, obovate, equal, free or slightly united. Stamens two or three with filaments naked or bearded: anthers oblong one often larger. Staminodes three. Ovary two or three celled. Capsule loculicidal: seeds in one or in two rows, with thick, hard, rough skin.

Species 60 in the tropics and sub-tropics chiefly of Asia.

Flowers blue, panicled . . . . A. dimorphum.
Flowers pinkish-copper coloured . . . A. lanuginosum.

Aneilema dimorphum *Daly.*; *F.B.I.* vi 377, III 10. Roots long not succulent; plant spreading by lateral budding of the rootstock. Stem 4 to 8 inches leafy below, glabrous. Leaf-sheaths $\frac{1}{2}$ inch; blades $1\frac{1}{2}$ to $2\frac{1}{2}$ by $\frac{1}{4}$ to $\frac{1}{3}$ inch. Flowers in open cymose panicles: bracts $\frac{1}{16}$ inch persistent. Flowers $\frac{1}{4}$ inch: petals obovate, with long narrow claw, and connate at the base of the blades; very thin and conspicuously veined. Stamens three, with bearded filaments. Staminodes three without beards, their heads deeply three-fid into rounded lobes. Stigma small. Ovary with one row of seeds in each cell. Capsule oblong obovoid. Seed 5 to 6 inches in each cell, one-seriate. **t. 553.**

Pulneys: on the downs. Shevaroys: January.

Gen. Dist. From sea shores to 7,000 feet.

In my F. N. P. Ht. this was named A. pulneyensis.

Aneilema lanuginosum *Wall.* ; *F.B.I.* vi 380, III 20. Stem erect, hairy as also the leaves. Leaves linear-oblong or lanceolate, acute, many veined. Pedicels axillary, 1 inch, jointed. Flower a pinkish-copper or salmon-colour ; drying blue. Capsule $\frac{1}{4}$ inch. **t. 554.**

Nilgiris : Naduvattam in grass, flower September.

Gen. Dist. Mysore hills. Bababoodons.

The flowers fade very quickly. It is useless to pick this rather fascinating plant.

CYANOTIS. F.B.I. 160 V.

Flowers many, in the axils of bracts in a double series forming a scorpioid cyme, with petals and stamens alone exserted. Sepals keeled, lanceolate. Petals joined below into a narrow tube. Stamens six, all perfect, with oblong anthers : filaments bearded with long hairs and thickened at the top. Ovary equally three-celled, each cell with two ovules, one pendulous from the top, the other erect from the base : seeds angular, rough with small pits : embryo at the end furthest from the placenta, with radicle pointing outwards, in fleshy endosperm.

Species, 30 to 35 in the warmer parts of the Old World.

KEY TO THE SPECIES.

a	Plants glabrous or hairy, not cottony	*b*
	Plants whitish with much cotton	*c*
b	Leaves mostly basal, long and narrow	1. C. pilosa.
	Leaves on the stems, 5 by $\frac{3}{4}$ inch glossy	2. C. villosa.
c	Stem stout, to 12 inches	C. arachnoidea.
	Stem slender, usually 6 inches	C. fasiculata.

Cyanotis pilosa *Schultes;* formerly C. Wightii *Clarke.* ; *F.B.I.* vi 387, V 8. Roots thick but not tuberous : stems 2 to 3 feet. Leaves 4 to 18 inches by $\frac{1}{3}$ to $\frac{3}{4}$ inch, sparsely hairy, mostly from the root. Stem leaves much smaller. Flower clusters dense, often long-stalked.

Upper bractiform leaves ¾ to 1½ inches lanceolate, acuminate. Bracteoles ovate, acuminate, curved. Filaments of stamens bearded. Ovary pilose at top. Seeds 4 more or less conical or pyramidal obscurely pelted. **t. 555.** Wight Ic. t. 2084.

Pulneys, on the slopes above Kodaikanal.

Cyanotis tuberosa *Schultes.; F.B.I.* vi 386, V 5. Somewhat similar to the last a larger plant but with tuberous roots, may also occur. It belongs to the Deccan.

Cyanotis villosa *Roem. et Sch., Wall. Cat.* 8995 *!; F.B.I.* vi 387, V 9. Stem 3 to 4 feet from a procumbent base, succulent often rooting and proliferous at the nodes. Young parts villous or silky: leaf-sheaths very much so, ¾ inch, with the split hidden under long hairs. Internodes 1 to 2 inches. Leaves 4½ by ¾ inch, glossy and drying dark brown above, fringed with silky hairs. Bracteoles ⅓ to ⅝ inch, as seen folded in the cymes nearly semi-half-ovate, the upper edge flat or slightly concave. Filaments slender. Style swollen below the tip. Capsule oblong obtuse. Seeds conical corrugated. Wight Ic. t. 2085.

In sholas. Pulneys: near Kodaikanal and below to Shembaganur. Flower September. Nilgiris: Coonoor. Shevaroys: about Yercaud, flower autumn.

Gen. Dist. Also Ceylon.

Specimens from the higher Pulneys have larger leaves than those from other places, but exactly as in Wall. Cat. 8995, and my Shevaroy specimens are nearly glabrous.

Cyanotis arachnoidea *Clarke, Wight's Kew Dist. No.* 2839 *!; F.B.I.* vi 386, V 7; White Spider Legs. Branches or stems half erect or sprawling on the ground, 10 to 20 inches, covered all over as also the leaves with fluffy white cottony or silky hairs. Leaf-stalks ¾ inch. Blades 2 by ⅓ to ½ inch, tapering evenly from the base

to near the apex. Cymes $\frac{1}{2}$ to $\frac{3}{4}$ inch, terminal, with a leaf or bract just below, and in the upper leaf-axils one or more. Stalked or sessile. Bracteoles lanceolate, curved, $\frac{1}{3}$ inch. Filaments bearded. Style bearded and thickened below the stigma. Capsule oblong: seeds elongate-conical, obscurely pitted. **t. 556.** (Not Wight Ic. t. 2083.)

In dry places. Nilgiris: Avalanche; Coonoor. Pulneys: on the downs above Kodaikanal, near the observatory, etc., flowers summer.

Gen. Dist. Also Ceylon.

Cyanotis fasiculata *Schultes; F.B.I.* v 387, V 12. An annual much smaller as a rule than any of the preceding, cottony all over, stems usually 3 to 6 inches. Stem leaves 1 by $\frac{1}{6}$ inch. Bracteoles $\frac{1}{3}$ inch. Very variable.

Pulneys: in the Shembaganur valley.

JUNCACEÆ.

Rush.

Mostly marsh plants, with erect green often round stems and leaves, in external appearance not unlike the Sedges. Flowers in clusters, but though small and brown, complete, with six brown and hard sepals and petals (which do not fall off), six stamens with erect anthers attached at their bases to the filaments, and a superior ovary with three long stigmas on a short or long style, ripening into a small capsule which opens in three segments. Seeds anatropous, many in Juncus, and three only in Luzula.

In everything except the hard persistent sepals and petals, the flowers are very similar to those of the LILIACEÆ.

Species 200, in cold damp spots all over the world.

Seeds many in the capsule . . . . JUNCUS.
Seeds three only in the capsule . . . . LUZULA.

JUNCUS. F.B.I. 162 I.

Glabrous plants, usually with sympodial rhizome. Sepals keeled or with thickened midrib. Stamens 6 or 3. Ovary of three cells each with many ovules, and capsule many-seeded.

Species about 220. Mostly in the temperate and Arctic regions, in cold and wet places.

The leaves differ considerably in different species. In some they are flat and grass-like, in others mere sheaths, in others cylindrical, in some needle-like. The young stem and cylindrical leaves are filled often with a soft pith which dries up leaving partitions at short intervals, and hence appear ribbed across.

KEY TO THE SPECIES.

Panicle of flowers lateral: no green leaves . . J. glaucus.
Panicle terminal, spreading: stems leafy . J. prismatocarpus.
Clusters small axillary and terminal . . . . J. bufonius.

Juncus glaucus *Ehrh.; F.B.I.* vi 393, I 3; common Rush. Stems numerous, from a slender creeping rhizome, erect, round, striate, rigid, with sheaths enveloping the base. Flower-cluster $\frac{1}{2}$ to $1\frac{1}{2}$ inches, at about one-third from the top of the stem, which thins out above it to a slender point. Sepals lanceolate $\frac{1}{6}$ to $\frac{1}{8}$ inch. Stamens six. Capsule ovoid, mucronate, seeds obtuse at both ends. **t. 557.**

The common Rush of the Kodaikanal lake.

Gen. Dist. North temperate climates, Himalayas from Kashmir to Nepal, southern end of the Western Ghauts.

Juncus prismatocarpus *Gr.; F.B.I.* vi 395, I 12. Stems tufted, compressed, 2 to 18 inches. Leaves in two ranks; sheaths $1\frac{3}{4}$ inches; blades 1 to 3 inches, cylindrical or flattened, $\frac{1}{8}$ inch wide, soft, hollow and divided internally by partitions $\frac{1}{8}$ to $\frac{1}{4}$ inch apart (which can

be felt or seen on the outside). Flower bunches at the ends and forkings of a widely branched inflorescence. Flowers six to ten in a bunch, pale yellow. Bracts $\frac{1}{12}$ inch. Sepals linear acute $\frac{1}{8}$ inch. Stamens three much shorter. Capsule longer, seeds egg-shaped or ellipsoid much pitted. **t. 558.**

In wet places. Nilgiris : on the downs, Pykara, etc. Pulneys : in Kodaikanal lake, etc.

Gen. Dist. Plains of Bengal and Punjab, Himalayas, Khasi hills, Deccan, Ceylon, Eastern Asia generally, Australia.

Juncus bufonius *Linn.; F.B.I.* vi 392, I 1. A small densely tufted plant, with very thin needle-like stems, leaves mostly from the roots, and pale green flowers, in small axillary cymes of 1 to 3. Stamens usually 6, but some terminal with 3 stamens only, and cleistogamous [F.M.P.] **t. 559.**

Nilgiris : on damp hill side. Flower September near sandy Nulla at toll-bar.

Gen. Dist. Natives of Northern India first recorded in my Fl. N. & P. Ht., apparently therefore a recent introduction.

LUZULA. F.B.I. 162 II.

Herbs of marshy places with narrow grass-like leaves and clusters of small flowers, similar to JUNCUS but differing in there being only one seed to each cell of the ovary.

Species about 30, in temperate regions.

Luzula campestris *DC.; F.B.I.* vi 401, II 3. Perennial by a short stout rhizome. Basal leaves 4 or 5 by $\frac{1}{4}$ inch, upper shorter and narrower. Stems 18 inches. Flower-clusters $\frac{1}{4}$ inch across in irregular umbels. Sepals $\frac{1}{12}$ to $\frac{1}{8}$ inch, ovate-lanceolate, acuminate. Capsules shorter, rounded, with short persistent stylar point. **t. 560.**

Pulneys : in Kodaikanal.

Gen. Dist. North temperate regions, western Himalayas at high elevations, Khasi hills, southern end of the Western Ghauts.

ARACEÆ.

Arum, etc.

Mostly perennial herbs with radical leaves. Flowers small, unisexual or complete, with or without perianth, massed in a thick spike (*spadix*), which is enclosed at first in a large often coloured bract (*spathe*). If flowers unisexual, then either in different spadices; or the male flowers above, the female below on the same spadix, and often sterile flowers or hairs between the two and at the top. Anthers sessile, two to four celled. Ovary one to three celled, with short style, discoid stigma and one or more ovules. Fruits fleshy, with usually one seed only.

Species 1,000, mainly in the tropics. In Europe, ARUM, Lords and Ladies, Friar's Cowl, etc., *Fr.* Gouet, *Ger.* Aronswurz.

Various genera are common in our gardens, e.g., ANTHURIUM and ALOCASSIA and the climbers on trees, POTHOS, PHILODENDRON, MONSTERA.

The so-called Easter-lily, Calla æthiopica *L.*, or Richardia africana *Kunth*, a native of South Africa, is established in damp places near Ootacamund.

ARISÆMA. F.B.I. 166 IV.

Cobra-flower.

Herbs with tuberous rootstock and palmately compound stalked leaves, and the top of the spadix sterile. Ovary one-celled.

Species about 50, Asia and North America.

Leaflets distinct: spadix entirely enclosed in the spathe . . . A. Leschenaultii.

Leaflet not all separate: end of spadix long and slender . . A. tortuosum.

Arisæma tortuosum *Schott; F.B.I.* vi 502, IV 18; Ratstail Cobra-flower. Stem salmon colour or green, mottled purple. Leaf-sheath very long, stalk 2 inches. Leaflets elliptic, pedately attached to each other, i.e., in

twos and threes. Spathe ½ inch wide at the base, with overlapping margins : hood 2 inches wide, finely striate, arching well over the mouth. Spadix elongate and projecting out of and above the spathe in a long rat-tail like appendage. **t. 561.** Wight Ic. t. 788.

Nilgiris : on the borders of one area, Pykara at 6,500 feet, Kotagiri, Coonoor. Not at the higher levels. Pulneys : not seen above Shembaganur.

Gen. Dist. Mountains of India from Simla southwards.

Arisæma Leschenaultii *Blume ; F.B.I.* vi 504, IV 25 ; common Cobra-flower. Very variable in size. Stem 1½ to 4 feet, pale or greenish, mottled with brownish purple markings : lower part with a few sheaths. Leaf solitary, with stalk of 4 to 12 inches above the sheathing base. Leaflets seven to thirteen, 4 to 7 by 1 to 2 inches, elliptic-oblanceolate or obovate, acuminate, all equally separate. Spathe, male or female, close below the horizontally spreading leaflets : tubular below, limb sharply bent over covering the spadix cordate-acuminate. Spadix quite straight, erect, not projecting beyond the mouth with flowers only on the lowest, contracted, one-third part ; above thicker, then narrowed slightly to the rounded tip. Female spadix with hair-like projections above (neutral flowers). Fruiting mass 6 inches by 3 inches, conical, the individual berries ½ inch across green and red. **t. 562.**

Very common in shady cool places. Pulneys : in Kodaikanal on shaded roadsides, in woods, etc. Nilgiris : Coonoor.

Gen. Dist. Western Ghauts.

ALISMACEÆ.

Water plants with usually showy flowers of the monocotyledonous type, but often with more than 6 stamens, and the carpels separate each with its own short

style, and one or more ovules inside. Fruit a head of achenes (one seeded) or follicles (many-seeded).

A small family of about a dozen genera and 50 to 60 species scattered (as are all water plants) all over the world except the Arctic regions. Familiar English plants are the Arrowhead. Flowering Rush (Butomus umbellatum) and Water Plantain (Alisma plantago) which occur also on various parts of India.

SAGITTARIA. F.B.I. 169 III.

Leaves from a perennial submerged rootstock, arrow-head-shaped. Flowers in irregular whorls on the branches of a pyramidal panicle, unisexual or mostly so. Sepals green. Petals thin white or coloured. Filaments of stamens compressed. Carpels many on a globose receptacle, compressed laterally, each with short style. Fruit a globose head of winged or crested achenes, each with one erect seed.

Species about 15.

Sagittaria sagitifolia *Linn.; F.B.I.* vi 561, III 1; Common arrowhead. Leaf blade deeply cordate with long acute backward lobes and bluntly acute apex. Panicles a foot or more. Petals white.

Fairly common in Mysore and reported from the upper levels of the Nilgiris but rare here.

Gen. Dist. Northern hemisphere.

ERIOCAULACEÆ.

Flowers unisexual, very small and massed in a head with an involucre of bracts below. Sepals three. Petals three. Stamens three or six. Ovary of two or three cells, with one erect ovule in each.

Genera 600, species 600 to 700, in the warmer parts of the world.

The family might be described as the COMPOSITÆ of the Dicotyledons.

ERIOCAULON. F.B.I. 171-1.

Hat-pin flower.

Herbs with all the leaves near the ground, and flower-heads on slender leafless scapes, ribbed and twisted and surrounded at the base by a prominent sheath with oblique mouth. Leaves narrow, ribbed. Flowers $\frac{1}{8}$ to $\frac{1}{20}$ inch long, each in the axil of a bract, whose grey turned-up end usually shows on the surface of the head. Sepals three, boat-shaped, or united into a spathe-like sheath which is split down in front. Petals three, on a short or long corolla tube, in all our species fringed with thick white hairs, and some at least with a prominent black mark near the top. Corolla tube in the male flower long : stamens six, with prominent anthers black or white. Ovary in the female flower stalked above the sepals : petals springing from just below the ovary, and between the cells, oblanceolate or spathulate, usually very thin, and fringed with long hairs. Fruit three nutlets.

• A very difficult genus, the flowers being minute and their differences only to be made out with the help of a good lens and much care.

A monograph by me on the Indian species appeared in the Journal of Indian Botany (now the J. Ind. Bot. Soc.), Vols. II and III. In it I gave reasons for regarding the genus as developed on eight distinct lines, in each of which a tendency to the reduction of parts (correlated no doubt with the massing of the flowers in a head) has manifested itself. Of these lines we have four represented by the hairy leafed E. Brownianum, the very long male-flower E. robustum the smooth leafed E. collinum, E. Gambiei and their allies, and the white-anthered E. melaleucum.

a { Anthers black . . . . *b*
  { Anthers white (or yellow) . . . . . E. melaleucum.

b { Heads $\frac{1}{2}$ inch or more across : scape about 1 foot . . *b*
  { Head under $\frac{1}{2}$ inch : scape 6 inches or less . . . . *c*

c { Leaves thick, smooth : heads thick . . E. robustum.
  { Leaves hairy : heads flat : involucral bracts black . . . E. Brownianum

d { Scapes 4 to 6 inches tufted : involucral bracts black ; receptacle villous . . . . d
Scapes solitary . . . . e
Scapes tufted 1 to 2½ inches : involucral bracts brown. E. Gamblei and E. Mariæ.
Leaves flat, weak : heads grey . . . . E. collinum.
Leaves firm, narrow, channelled above : heads white . . E. Neo-Christopheri. }

e { Involucre black . . . . E. Geoffreyi.
Involucre white . . . . E. Oliveri. }

Eriocaulon robustum *Steud. ; F.B.I.* vi 572, I 4 ; White-tailed Hatpin flower, Chrysanthemum scented. Rootstock stout, as thick as the finger or thicker, sometimes creeping, densely clothed below with the dead leaves. Leaves usually 3 or 4 inches long (1 to 9), and narrowed gradually from a clasping base, 1 inch broad, to the obtuse end, lanceolate or oblanceolate, quite glabrous, finely striate. Flower stems solitary, about a foot high (8 inches to 3 feet), finely ribbed and twisted ; sheath rather longer than the leaves, expanded ½ inch below the mouth. Heads ½ to ¾ inch broad, and not quite so high ; usually broadest near the top ; covered when the flowers are out with the long white, downward directed petals of the male flowers, except often in a band above the base, so that the head appears narrowest here ; very slightly scented like Chrysanthemum. Involucral bracts many-seriate, ovate, acute, glabrous or with a very few short hairs, scarious, olive-black in colour. Receptacle villous, more or less hollowed at the top. Floral bracts obovate-lanceolate-deltoid, fringed at the top with white hairs. *Male flowers*—Petals oblanceolate, hairy, one much longer than the other two and the bract, and more hairy, all three with a black gland. Anthers

black. *Female flowers*—Sepals three : petals oblanceolate, all equal in length. Ovary of three cells, yellow : styles long, connected only near the base. **t. 564.** *b* bracts ; *r* receptacle in section ; *s* three stamens.

On the bank of the river at Pykara. Coonoor (*Clarke*).

Only known from the Nilgiris.

The slight enlargement of the sheath just below the mouth is not mentioned in the descriptions in *F.B.I.* and *Das Pflanzenreich,* but seems distinctly characteristic ; so also is the frequent narrowing of the head above the base, by the greater length of the long petals of the male flowers in the upper and the lowest circles. The flower-head has none of the strong honey scent of E. nilagirense, but the faintest trace of that of the Chrysanthemum.

Eriocaulon Brownianum *Rubl.*, var. nilagirense, formerly E. nilagirense *Steud ; F.B.I.* vi 576 *included in* E. Brownianum, *but not Wall. Cat.* 6066 ! I 18 * ; Black-backed Giant Hatpin flower, Honey scented. Rhizome as thick as the finger, with two or three flower-stalks only. Leaves linear-oblong, acute, 6 to 12 by $\frac{1}{3}$ to $\frac{1}{2}$ inch, hairy. Peduncle about twice as long, hairy, not much twisted : sheath 6 inches, with very long open mouth (1 to $1\frac{1}{2}$ inches), acute, translucent, with a tuft of hairs at the extreme base. Involucral bracts, oblong-ovate obtuse, black, but covered with white silky hairs and so almost grey : floral bracts oblanceolate-cuneate, hairy on the back of the triangular, not acuminate, end. *Male flowers*—Sepals sheath $\frac{1}{8}$ inch, free, but glabrous except for a fringe of white hairs at the end. Corolla trumpet-shaped, lobes small, very acute, equal, ciliate only at the tips. Stamens six ; anthers oblong, black. *Female flowers*—Sepals three, free, boat-shaped with decided ciliate keel, fitting by concave bases over the cells of the ovary. Petals very slender, linear oblanceolate villous below hairs. Each nutlet in fruit enclosed by the

base of a sepal, the rest of which forms a slightly twisted wing. **t. 565**.

In damp places. Pulneys: on the Kodaikanal downs. Flowers in September. Nilgiris: *Hohenacker* 953! ; type is No. 950, not seen.

The use of the sepals as a wing to the nutlet has not, I believe, been described before. E. Brownianum *Wall. Cat.* 6066 is a Silhet plant and has smooth, smaller, light-brown involucral bracts.

Eriocaulon collinum *Hook. f.*, *Thwaites enum.* 44, *C.P.* 1000! ; *F.B.I.* vi 584, I 41 ; common small Grey-head. Stems tufted. Leaves $1\frac{1}{2}$ to $2\frac{1}{2}$ by $\frac{1}{8}$ inch, flat weak, lanceolate acute. Scapes many, 3 to 8 inches, twisted when dry: sheaths $1\frac{1}{4}$ inches; mouth oblique, not very acute. Involucral bracts all black, or the lowest and outermost in bud brown. Floral bracts numerous. *Male flowers* very small, 1·5 mm. Sepals—Spathe $\frac{1}{10}$ inch hardly as long as the pedicel. Corolla tube funnel-shaped, very slender below; lobes unequal, one petal longer and narrower, fringed with long thick hairs. *Female flowers*—Sepals boat-shaped, with white hairs over most of the back and keel. Petals long, lanceolate, fringed with thick hairs at the top but not hairy. Receptacle villous. **t. 566.**

In wet places, common. Nilgiris: on the plateau, Pykara, Kotagiri, etc. *Fyson* 5461, 1086, 2084, 2695, 2720, 2920, 2993, 2995. *Bourne* prob. 3129.

Gen. Dist. South India and Ceylon at Newera Elia.

All parts of the plant vary much. The leaves may be short or long, the scapes thin or thick and the heads $\frac{1}{6}$ to $\frac{1}{4}$ inch in diameter and nearly black to almost white. The whiteness of the head is due partly to the hairs of the floral bracts, partly to the female or male petals the tips of which emerge when the flower is fully out from between the bracts, especially the one longest male petal.

To this is due probably the differences often to be found between plants growing in a marsh and those on the drier ground round it, the heads being of different age, differences which led me in 1914 to describe two whiter forms as E. Christopheri and E. Oliveri and to include them in Fl. N. & P. Hl. tops. They were reduced to E. Collinum in my monograph of the Indian species in Journ. Ind. Bot. Soc., Vol. II (1921).

E. odoratum *Dalz. F.B.I.* vi 574 I 9. Similar to the last but the large male petal more developed and heads smelling of Chamomile, on rather slender scapes, may occur. F.M.P. gives the species as on the Pulneys ; and on Travancore mountains to 7,000 feet.

Eriocaulon Geoffreyi *Fyson ;* I 47. Scapes solitary, very slender, 2 to 5 inches : sheath ½ inch, with scarious bifid mouth. Leaves ½ to 1¼ inches, flat, acute, about nine-nerved, often recurved. Heads ¼ inch, white with the hairs of the male petals. Involucral bracts black, glabrous. Receptacle glabrous. Floral bracts obovate-cuspidate, black with thick white hairs on the back and upper margin. *Male flowers*—Sepals black, united into a spathe, split down the front. Corolla tube slender, tapering downwards, enlarged above and cup-shaped ; petals subequal with long thick white hairs and large black glands. Anthers black. *Female flowers*—Sepals boat-shaped. Petals oblanceolate with fine long white hairs nearly to the base. **t. 567.**

On damp ground. Pulney hills. South India, 7,500 feet. *Fyson* 2165, 2085.

Not known elsewhere.

The solitary scapes and stiff, often recurved, leaves are very characteristic.

Fischer in F.M.P. reduces this to E. melaleucum *Mart.* on the assumption that the yellow anthers of that species turn black. I have examined scores of plants and have never seen black and yellow anthers on the same

head. I have not, unfortunately, been able to see the actual plant on which Martins founded his species, but suspect that plants with yellow anthers were mixed with plants with black. See Journal of Indian Botany, III, p. 18.

Eriocaulon Mariæ *Fyson ;* I 48. Scapes several, 1 to 2 inches, slender : sheath $\frac{1}{2}$ inch : mouth single, very acute, slightly enlarged. Leaves $\frac{1}{2}$ to $\frac{3}{4}$ inch by $\frac{1}{12}$ to $\frac{1}{8}$ inch, strongly ribbed, glabrous. Heads $\frac{1}{8}$ to $\frac{1}{6}$ inch : involucral bracts light brown, glabrous. Floral bracts acute, black with tufts of white hairs. Villi of receptacle very long and copious. *Male flowers* :—Sepal $\frac{1}{25}$ inch united in a spathe split in front. Corolla tube and lobes very small, glands large. *Female flowers* $\frac{1}{16}$ inch : sepals 3, equal or one narrower, petals divided almost to the base into a number of fine hairs. **t. 567.**

Fyson 2086. Pulneys : at 7,500 feet, in a marsh on the downs above Kodaikanal.

Not known elsewhere.

The very dwarf habit, yet broad leaves, and the remarkably divided female petals make this distinct from any other.

This species was first described by me in the Kew. Bull. of 1914 as differing from E. Thwaitesii in the female flowers having 3 in place of 2 sepals. Later on examining all the sheets available of Indian species of Eriocaulon, I came to the conclusion that we must regard E. Thwaitesii as variable in this respect. But as the plants here named E. Mariæ differ as markedly from E. Thwaitesii as many other species now separated in the F.M.P. and as much as the next, I treat it again as a distinct species. E. Thwaitesii *Koern*, belongs to lower levels. It is a larger plant, has three female sepals and nearly glabrous floral bracts.

E. Gamblei *Fischer. ; Kew Bulletin* 1930, *p.* 160. Very similar to the above and apparently differing only in having two sepals to the female flowers as in E. Thwaitesii.

Nilgiris : Naduvattam.

Eriocaulon melaleucum *Mart. ; F.B.I.* vi 574 ; described in J.I.B. iii, *p.* 18, as E. horsleykondæ var. megalocephala. Very similar to E. Geoffreyi, but with white (or yellow) anthers, not black. ?

Nilgiris : on slopes of Snowdon, and on roadside of Pykara to Naduvattam, abundant in September.

See note below E. Geoffreyi. C.E.C. Fischer in Fl. M.P. following Martius regards these species as the same, the anthers turning black. I have never found this. It is a point worth examining plants for—whether black and white anthers are ever found in the same head.

Eriocaulon Richeanum. *Rubl.* ; (E. Horsleykonda *Fyson.* Journ. Ind. Bot. Soc., Vol. III (1922), pp. 13, 16). Scapes 6 to 10 inches, sheaths a third as long. Heads $\frac{1}{4}$ inch. Bracts black ; receptacle glabrous. Female sepals conspicuously extended between the bracts, with large black gland. Male petals equal : anthers white.

Shevaroys : in shallow " dew ponds " on the summit of Shevaroyan and adjoining peaks.

Gen. Dist. At 3,000 feet top of Horsleykonda, Panchgani, etc.

CYPERACEÆ.

Sedge.

Sedges are distinguished from grasses by the stem being solid and usually triangular, the leaves in three (not two) vertical rows, with a complete sheath at the base (not split down the opposite side) and without ligule ; and (though the flowering portion being made up of spikelets may appear at first sight similar) by the absence of the paleas and lodicules, and by an ordinary straight embryo in the triangular nut, the cotyledon of which does not stay inside on germination.

They are as a rule found only in marshy places, and have a perennial creeping stem (rhizome) and grass-like flowering stems and leaves, which however are of less value as fodder. The flowers are exceedingly simple, and consist of an ovary with single, trifid or bifid style, surrounded by two or three stamens, whose anthers are not

versatile, but attached by their bases. There are often also three to six bristles which are regarded as representing the lost perianth. Each such flower is in the axil of a bract called the *glume*, and the glumes are arranged in short or long *spikelets*, the lowest glumes being often empty. In CAREX a complication is introduced by the presence of a bottle-shaped "utricle" round the ovary, and the "flowers" are unisexual. But this is referred to under the genus. The axis of the spikelet is called the *rachilla.*

The family comprises some 3,000 species, in 60 genera, and is found all over the world, mostly in damp or sour ground. Like the Grasses they are commonly gregarious and pollinated by wind.

KEY TO THE GENERA.

a { Large leafy sedges, the spikelets in a compound panicle, or the flowers unisexual in partly male partly female, or entirely unisexual spikes . . . . *j*
Small plants, leaves mostly from the root, spikelets few or in umbels on a scape, leafless except for bract under the umbels. (See also under Carex) . . . . . *b*

b { Spikelets 2 or 4 sided, of glumes in two ranks . . . *c*
Spikelets ovoid or cylindrical, of spirally arranged glumes *f*

c { Spikelets small, crowded in a head or spike . . . . *d*
Spikelets distinct, umbelled at the top of the scape . . *e*

d { Spike ovoid, white . . . . . . *p*. 633. KYLLINGA.
Spike cylindrical, several umbelled
p. 635. CYPERUS sp. 3 and *p*. 637. MARISCUS.

e { Spikelets narrow. Stigmas 3 . . . *p*. 635. CYPERUS.
Spikelets broader than thick. Stigmas 2 . . . . .
p. 634. PYCREUS.

f { Style swollen at the base, jointed above or below the swelling . . . . *g*
Style passing gradually into the ovary or nut . . .

g { Leafless. Spikelets solitary, terminal oblique . . . *p.* 637. ELÆOCHARIS.
Leaves many from the root, very slender . . . *h*

h { Stylar base remaining as a button on the nut . . . . *p.* 641. BULBOSTYLIS.
No button on nut . . . . *p.* 638. FIMBRISTYLIS.

i { Spikelets solitary, nearly ½ inch, spiny *p.* 643. FUIRENA.
Spikelets white, ovoid, clustered sessile . . . . . . *p.* 643. LIPOCARPHA.
Spikelets one or many. Very varied in habit . . . *p.* 641. SCIRPUS.

j { Spikelets in irregular corymbs. Stigmas 2 . . . . *p.* 644. RHYNCOSPORA.
Spikelets lanceolate, ⅙ inch, unisexual or not . . . . *p.* 644. SCLERIA.
Spikes of one–flowered unisexual spiklets, the ovary in a 'utricle' . . . . *p.* 645. CAREX.

KYLLINGA. F.B.I. 172 I.

A genus distinguished among all our Cyperaceæ by the white nearly globular head of numerous compressed spikelets with two or three unequal leaves spreading out just below it. Spikelet of four or five glumes, in two ranks rachilla jointed and breaking off below gl. iii : glumes i and ii empty ; gl. iii bisexual ; gl. iv rarely with seed ; gl. v rudimentary. Nut compressed, the style continuous with it and scarcely enlarged at the base.

Species about 33, in all the warmer parts of the world, not in Europe.

Kyllinga melanosperma *Nees ; F.B.I.* vi 588, I 3. A perennial with short thick glabrous rhizome 1 inch long. Stems 6 inches (up to 20 inches). Leaves, all from the rhizome, 2 to 6 inches. Head of spikelets ⅕ by ¼ inch, with leaf-like bracts, ½ to 2 inches long, close under it. Spikelets ⅛ inch long, with one black nut. Flowering

glume ovate ; acute, keel green. Stamens often three. Nut two-thirds as long as the glume. **t. 568.**

Nilgiris : on the downs Ootacamund to Pykara, flowering May. Pulneys : on the outskirts of Kodaikanal and below to 4,000 feet.

Gen. Dist. Ceylon, Singapore, Java, South Africa, Madagascar.

Kyllinga cylindrica *Nees ; F.B.I.* vi 588, I 2. Similar in habit to K. melanosperma *Nees*, but heads cylindrical. **t. 569.**

PYCREUS. F.B.I. 172 II.

Spikelets brown, much longer than broad, and broader than thick, in umbels or bunches at the top of the slender stems, with a few leaf-like bracts just below them. Glumes boat-shaped, in two ranks. Nuts flat (distinction from Cyperus).

Species 50 in all warm and temperate regions.

KEY TO THE SPECIES.

a	Stem clothed half-way in leaf-sheaths .	P. sanguinolentus.
	Leaves at base of stem only	*b*
b	Stems tufted	P. globosus.
	Stem solitary	P. unioloides.

Pycreus sanguinolentus *Nees ; F.B.I.* vi 590, II 4. Rhizome creeping, stem 3 to 6 (3 to 20 inches). Leaves as long or shorter. Spikelets ½ to 1 by ⅙ inch mostly sessile clustered : glumes boat-shaped, obtuse, with three green veins on the back, otherwise reddish brown.

Pulneys : Silver Cascade below Kodaikanal (*Bourne*). Nilgiris : up to 6,000 feet.

Pycreus globosus *Reichb. ;* formerly P. capillaris *Nees ; var.* nilagiricus ; *F.B.I.* vi 591, II 7. Stems numerous and tufted, up to 2 feet high. Leaves slender

and weak, mostly from the base, but also on the lower half of the stems where the uppermost blades may be only 1 inch by $\frac{1}{6}$ inch. Spikelets $\frac{1}{4}$ to $\frac{1}{2}$ inch by $\frac{1}{12}$ inch, much compressed, rigid; in sessile or peduncled clusters umbelled at the top of the tall scape, rich chestnut-brown with green midrib. Nut dark brown. **tt. 570, 571.**

Pulneys: flower June. Shevaroys: September.

Gen. Dist. Africa, South-east Asia, Australia, Deccan and Ceylon. t. 571 is of a plant growing in water, and more slender than the usual, t. 570.

Pycreus unioloides *Don var.* angulata; *F.B.I.* vi 593 as P. angulatus *Nees* II 11. Rhizome long $\frac{1}{12}$ inch diameter. Stem $1\frac{1}{2}$ to 3 feet. Leaves $\frac{1}{6}$ to $\frac{1}{5}$ inch wide, two-thirds length of stem. Rays of umbel up to 2 or 4 inches, or in poor specimens reduced to a head of a few spikelets. Spikelets $\frac{2}{3}$ by $\frac{1}{5}$ inch, compressed. Glumes one or three-veined with shiney yellow-brown sides. Rachilla in fruit zigzag. Anthers large orange, persistent for a considerable time. Nut compressed black. An altogether stouter plant than the other species. **t. 572.**

Nilgiris and Pulneys.

CYPERUS. F.B.I. 172 IV.

Stem erect, simple, leafy only at the base. Spikelets arranged in umbels or spikes or mixtures of these, and very narrow. Glumes many, in two ranks; two at base of spikelet empty, one to three at the top male only. Axis (*rachilla*) not jointed near the base nor falling off. Stylar branches three. No bristles round the ovary.

Species 300 in all warm and temperate regions.

KEY TO THE SPECIES.

Spikelets sessile in a head, broad . . . 1. C. Tennerifæ.
Spikelets very slender, in compound umbels . 2. C. distans.
Spikelets in dense spikes . . . . . 3. C. digitatus.

1. **Cyperus Teneriffæ** *Poir.*; *F.B.I.* vi 601, IV 12. Small sedges with rather large spikelets, clustered sessile on a slender scape. Whole plant glabrous, more or less red. No stolons. Stem 2 to 6 inches (or more), leaves half as long, with rather broad sheaths. Bracts 2, the longer 1½ inches. Spikelets about ⅝ by ⅙ inch, sessile. Glumes striate with about 9 strong veins, and acute tips turned outwards. Nut three-angled with concave faces, reticulate black and white.

Nilgiris: in dry often rocky places (*F.M.P.—Hobenacher*).

Gen. Dist. The Deccan, Coromandal, Arabia, Africa.

2. **Cyperus distans** *Linn.*; *F.B.I.* vi 607, IV 32. Glabrous plants. Rootstock up to 2 inches by 1/10 dotted with brown acute scales. Stem about 12 inches (4 to 36 inches). Leaves narrow. Bracts 3 to 6, the longest 8 (up to 16) inches. Rays of umbel 1 to 4 inches, the longest branched again. Spikelets very slender, 1/20 by ½ to 1 inch, reddish brown; glumes rather distant, only slightly overlapping and rachilla in consequence wavy. Nut dark black.

Nilgiris: Kotagiri in bed of a stream (*Sedgwick*) and fairly common. Pulneys: Poombari (*Bourne*).

Gen. Dist. In all warm regions.

3. **Cyperus digitatus** *Roxb.*, *var.* **Hookeri**; *F.B.I* vi 618, IV 59$^{\beta}$. Stem tall, 1½ to 4 feet, three-angled near the top. Leaves ½ to ⅔ inch broad, often as long as the stem. Spikelets ⅙ to ¼ inch, arranged in dense spikes 1½ to 2 inches by ⅗ inch, these again in stalked umbels crowded at the top of the stem in a compound umbel of 8 to 24 inches. Bracts of umbels leaf-like, sometimes 2 feet long: stalks 1 to 8 inches. Glumes 1/30 inch, boat-shaped, ultimately light brown, 5 to 8 pairs to a spikelet.

Nilgiris : Ootacamund, Pulneys : Neutral saddle. Pykara, etc., flowering winter months, Coonoor. Shevaroys : under Shevaroyan. The Pulney and Shevaroy plants are more slender and spikes narrower than the Nilgiri.

Gen. Dist. of species. The tropics generally.

MARISCUS.

Similar to CYPERUS, but the axis (racheola) of the spikelet breaking above the two lowest, empty glumes.

Mariscus cyperinus *Vahl.; F.B.I.* vi 621, V 4. Rhizome hardly any. Lowest sheaths red, not swollen. Leaves 6 to 12 inches by $\frac{1}{8}$ inch, as tall as the stem. Spikes 1 inch long, about 7 to 10 sessile at the top of the stem, bracts below them leaf-like, 4 to 6 inches. Spikelets cylindrical, very thin, $\frac{1}{4}$ by $\frac{1}{50}$ inch, sloping slightly upwards, very numerous and forming a compact cylindrical spike. **t. 573**

Nilgiris : Coonoor hill-sides in grass. Flower summer and autumn. Pulneys : Kodaikanal, etc.

Var. Bengalensis. Umbel contracted to a head. Spikelets linear with 2 to 4 nuts.

Kotagiri : (*Sedgwick* 1620).

Gen. Dist. Tropical Asia and Polynesia.

ELÆOCHARIS. F.B.I. 172 VII.

Stems leafless, each ending in a brown oblong spikelet of many spirally arranged glumes, characterized by the base of the style being thickened but also apparently jointed just above the nut, and by the hypogynous bristles round the ovary.

Species over 100 in all parts of the world.

Elæocharis congesta *Don; F.B.I.* vi 630, VII 15. Stems tufted 4 to 8 inches or more : sheaths crimson at the base. Spikelets $\frac{1}{4}$ to $\frac{1}{3}$ inch, subtended usually by a

leafy bract ; occasionally with a short branch just below Flowers many with bristles. Ovary three-angled. Style three-fid, with swollen persistent base. Nut quite smooth **t. 574.**

On the Nilgiri downs.

Gen. Dist. Lower hills of India and Kashmir, Nilgiris, Ceylon, Pulneys 5,000 feet.

FIMBRISTYLIS. F.B.I. 172 VIII.

Herbs with very slender leaves, all from the rootstock, and slender stems terminating in a single cluster, or an irregular umbel of brown spikelets. Glumes spirally arranged. Flowers without bristles, style enlarged at the base, and deciduous by a joint from the nut, not leaving the base on it. Outer surface of nut often with the appearance of ribs, wrinkles or cross-hatching, on account of the large cells which compose the skin.

Species 125, in all the warmer parts of the world.

KEY TO THE SPECIES.

a	Spikelets solitary	1 F. Kingii.
	Spikelets clustered	5 F. uliginosa.
	Spikelets in an irregular umbel . .	4 F. paupercula.
	Spikelets in an irregular panicle	*b*
b	Style two-fid	*c*
	Style three-fid	6. F. cyperoides.
c	Stem 2 to 4 inches, spikelets $\frac{1}{6}$ inch, angled	2. F. dichotoma.
	Stem 4 to 24 inches, spikelets $\frac{1}{4}$ inch, terete	3. F. diphylla.

1. **Fimbristylis Kingii** *C. B. Clarke ; F.B.I.* incl. F. subtrabeculata *C. B. Clarke* vi 633, VIII 8. Tufted along a short rhizome. Leaves very slender, hair-like, $1\frac{1}{2}$ to 6 inches. Stems almost as slender 4 to 10 inches. Spikelet solitary, terminal, egg-shaped, $\frac{1}{6}$ to $\frac{1}{2}$ inch, by

about half as much, glumes imbricate, on all sides, concave, with three to five slender nerves, glossy, chestnut-brown, the lowest empty. Stamens three. Stylar arms long. Nut about $\frac{2}{5}$ of glume, white ; outer cells squarish and transversely elongated. **t. 575.**

Nilgiris : Pykara. Pulneys : below Church Cliff, Pillar Rock. Not at the highest levels.

2. **Fimbristylis dichotoma** *Vahl.* ; *F.B.I.* vi 635, VIII 14. Usually a small plant, 2 to 6 inches high only, with slender leaves all from the rootstock. Scapes longer. Umbels de-compound, oblong, angular by the strong keels of the glumes, which are prolonged as a small outward turned point. Style two-fid. Nut straw-coloured, striated.

Nilgiris : Coonoor, and down to the plains.

Gen. Dist. Throughout India and warm parts of the Old World.

3. **Fimbristylis diphylla** *Vahl.* ; *F.B.I.* vi 636, VIII 15. Very similar to the last but a much larger plant, the scapes running to 2 feet ; and the spikelets larger and ovoid or cylindrical, the keels of the broad glumes being less pronounced and not projecting.

Nilgiris : Coonoor.

Gen. Dist. Throughout India and all warm regions.

4. **Fimbristylis paupercula** *Boeck.* ; *F.B.I.* vi 647, VIII 47. Rhizome short, stems tufted 6 to 14 inches, ribbed. Leaves shorter, 2 to 10 inches, by sometimes $\frac{1}{8}$ inch, channelled above, with minute roughness along the margins, otherwise glabrous. Spikelets in an irregular terminal compound umbel, each single umbel consisting of a central sessile spikelet and two or three others on slender stalks of $\frac{1}{6}$ inch, from the axils of $\frac{1}{8}$ inch

acuminate bracts. Glumes acuminate or shortly awned, obscurely five-nerved: margins hyaline. Nut with transverse marking.

Pulneys: on the downs, on dry slopes, etc., common. Nilgiris: Coonoor.

5. **Fimbristylis uliginosa** *Steud.*; *F.B.I.* vi 648, VIII 50. Plants tufted, clothed at the base with dead sheaths. Leaves 1 to 3 inches, very slender and hair-like; sheaths below striate. Stems 4 to 8 inches, slender. Spikelets many tufted at the top, sessile or some stalked, or reduced to one only; with one or two slender leafy bracts. Glumes ovate, aristate or mucronate, with hyaline margin. Style three-fid but obovoid. **t. 576.**

Nilgiris: very common on the open downs to Pykara, Pulneys. Not known elsewhere. Rendered very conspicuous in the early morning by the dew glistening on the white styles.

The long yellow anthers erect on their filaments protrude in tufts above the spikelets.

6. **Fimbristylis cyperoides** *Br.; var.* **cinnamometorum**: *F.B.I.* vi 650, VIII 56. Stems tufted, on a short rhizome, very slender but thickened at the base by the sheathing bases of the leaves. Leaves several, very slender. Spikelets small, $\frac{1}{6}$ by $\frac{1}{20}$ inch irregularly umbelled in spreading panicles. Glumes few, progressively longer, from the very small outer imbricate empty lowest ones to the distichous middle two to four which are fertile, and the uppermost three to six which have stamens or nothing. Style long. Nut round-trigonal, with seven to eleven ribs on each face.

Pulneys: on the high downs and below to Silver Cascade, and on the plains.

Gen. Dist. North Australia, Philippines, Caroline Islands.

BULBOSTYLIS. F.B.I. 172 IX.

Herbs with hair-like leaves and slender scapes bearing an irregular umbel (or head) of small brown spikelets, similar in all respects to FIMBRISTYLIS, except that the base of the style remains on the nut as a tumour.

Species 60 to 70 in all warm countries.

Bulbostylis capillaris *Kenth, var.* trifida ; *F.B.I.* vi 652, IX 3. Stems tufted 4 to 8 inches, leaves as long or shorter, bristle-like, glabrous. Umbels of 3 to 5 spikelets, on pedicels of $\frac{1}{2}$ to 1 inch. Spikelets $\frac{1}{6}$ inch, ovoid. Glume ovate, the green keel hardly produced.

Nilgiris : Kotagiri in stream-bed. Pulneys : below Shembaganur.

Gen. Dist. B. capillaris extends all over America. *var.* trifida all over the warm parts of the Old World.

SCIRPUS. F.B.I. 172 X.

Herbs of very varied habit, slender or stout, spikelets of many glumes spirally arranged, except the lowest distichous and 1 or 2 empty. Flowers with bristles. Style continuous with ovary (not swollen or jointed), with 3 or 2 stigmas.

Species about 125 in all regions.

KEY TO THE SPECIES.

Stem and leaves very slender . . . . . . S. fluitans.
Stem stout, three-angled, no basal leaves . S. mucronatus.
Stem cylindrical, enclosed by a leaf sheath at the base . . . S. sub-capitalus.

Scirpus fluitans *Linn.* ; *F.B.I.* vi 653, X 1. Stems weak, branched, and leafy, 2 to 12 inches long, flaccid in water or on mud. Leaves $\frac{1}{2}$ to $2\frac{1}{2}$ inches, very narrow. Spikelets solitary, terminal on the stem and its branches, $\frac{1}{8}$ by $\frac{1}{16}$ inch. Glumes boat-shaped, the lower not much

shorter than the upper, more or less imbricate or distichous; lowest empty, the others all fertile, without bristles. Style continuous with the top of the ovary. Nut one-half to two-thirds the glume.

Pulneys : on the downs, Pillar Rocks shola, etc. *Bourne.*

Gen. Dist. Nilgiris, Ceylon, Khasia, and nearly all regions.

Scirpus mucronatus *Linn.; F.B.I.* vi 657, X 11. A robust water-sedge, with triangular green stems, 2 or 3 feet high, having a dense bunch of spikelets on one side an inch or so below the top. Roots fibrous. Stem enclosed below in a triangular sheath. Membranous on one side of the blunt top. Spikelets ovoid, $\frac{1}{3}$ inch : glumes many, closely imbricate, ovate sub-acute, many-ribbed. Bristles five or six unequal, retrorsely scabrous : the two longest nearly as long as the nut. Style three-fid. Nut obovoid, trigonous, black, smooth, shining, half as long as the glume. **t. 577.**

Pulneys : in the lake at Kodaikanal.

Gen. Dist. Throughout India, Europe, Madagascar, the warmer parts of Asia, and Australia.

Scirpus sub-capitatus *Thw.; F.B.I.* vi 661, X 20. Stems many from a short woody rhizome, round, sheathed at the base and for about two inches ; quite bare above for about twelve inches, and then bearing a close tuft of many spikelets from the axils of shorter, acuminate bracts. Spikelets, $\frac{1}{3}$ to $\frac{1}{2}$ inch, many-flowered, brown. Glumes except the lowest in two ranks, entire. Bristles long, slender, slightly thickened at the tips. **t. 578.**

Pulneys : near Kodaikanal by sholas.

Gen. Dist. Deccan Peninsula, Nilgiris, Ceylon, and eastwards to Sumatra and China. Not northwards in the Bombay Presidency.

FUIRENA. F.B.I. 172 XII.

Stem leafy in upper part. Spikelet distinguished from the preceding genera by its size ($\frac{2}{5}$ inch) and the long awns on the spirally arranged, glumes. Bristle in the flower 6 : three outer short, linear, three inner obovate stalked. Stylar branches 3 long. Nut trigonous, small, with small point where style attached.

Species 25, in all warm countries.

Fuirena pubescens *Kenth.* var pergamentacea *Fischer, Fl. M. Pr. p.* 1669, *F.B.I.* vi 665, XII 1.* Rhizome short, creeping. Stem three-angled, glabrous, except near the spikelet where it is pubescent. Leaves $\frac{1}{2}$ to $8\frac{1}{2}$ by $\frac{1}{6}$ inch with recurved margins, spikelet $\frac{2}{5}$ inch, ovoid : glumes $\frac{1}{8}$ inch hairy : awn as long.

Pulneys : Neutral Saddle (below Perumal) *Bourne* 3096, flower June.

LIPOCARPHA. F.B.I. 172 XIII.

Stem leafy at the base only, and bearing high up a bunch of one to ten egg-shaped spikelets with subtending bracts : distinguished from the closely allied SCIRPUS by each flower having two very thin elliptic scales (formed by coalescence of bristles).

Species 13 in warm climates.

Lipocarpha argentea. *Br. ; F.B.I.* vi 667, XIII 1. Rhizome short, vertical. Leaves 4 to 6 by $\frac{1}{6}$ inch. Stem 4 to 18 by $\frac{1}{8}$ inch, three-cornered. Spikelets egg-shaped, six to ten in a close terminal bunch with two or three long tapering bracts of different lengths ($\frac{1}{2}$ to 3 inches) immediately below. Glumes imbricate on all sides, finally deciduous from the persistent rachilla.

Scales with two marginal and two central strong nerves. Nut egg-shaped.

Nilgiris : Pykara, etc. Flowering from May. Pulneys : Silver Cascade 5,500 feet, not above.

Gen. Dist. All over the tropics and sub-tropics of the Old World.

RHYNCOSPORA. F.B.I. 172 XIV.

Spikelets with the lowest three glumes empty, one or more nut-bearing glumes in the middle, and one or two male or sterile, thinner and unkeeled, imbricate glumes at the top. Style with a swollen base which remains on the nut, but is distinguishable from it ; bifid.

Species 150 in the warmer regions of the world, especially America.

Rhyncospora glauca *Vahl. ; F.B.I.* vi 671, XIV 9. Stems tufted, 10 to 14 (4 to 24) inches, leafy. Leaves several from nodes on the stem, $\frac{1}{10}$ inch wide, acute, glabrous. Spikelets several in small corymbs, stalked in the axils of the upper leaves forming a long irregular panicle. Glumes round-backed but keeled. Nut $\frac{1}{10}$ inch, light brown, transversely ribbed, capped by the papery persistent style which extends a little down the sides. Bristles as long as the nut, with minute hairs pointing upwards (to see these requires a compound microscope). Stamens 2.

Nilgiris : in swamps on the downs near Ootacamund. Pulneys : near Kodaikanal.

Gen. Dist. South India, Cochin, China.

SCLERIA. F.B.I. 172 XXVI.

Robust sedges with leafy stems, and open panicles of narrow spikelets, consisting of two or more empty glumes at the base, above these one with ovary only, then one

or more with stamens only : or spikelet bisexual. Styles three-fid. Nut bony.

Species about 150 in warmmost climates.

Scleria cochinchinensis *Druce ; F.B.I.* S. elata vi 690, XXVI 16, and S. melastoma vi 692, XXVI 24. Rhizome stout, woody, horizontal. Stem to 3 feet. Leaves narrow, 1 to 2 feet by $\frac{5}{8}$ inch, tapering to a fine point, and scabrid on the veins and edge (so as to cut the skin). Spikelets $\frac{1}{6}$ inch narrow. Glumes aristate. Nut roundish, white, $\frac{1}{8}$ inch, with reticulate surface.

Pulneys : about 6,000 feet. Shevaroys. And at lower levels.

CAREX. F.B.I. XXVIII.

In this genus the stamens are borne in the axil of a bract, in every way similar to the glume of Cyperus or any of the other genera, but the ovary is surrounded by a bottle-like covering called the utricle. Stylar branches 2 or 3.

The morphology of this utricle and of the bract outside it has been much debated, but since the former has two nerves it has been agreed generally that it is formed by the union of two glumes, and that the bract is therefore not a glume but the bract of a spikelet which is reduced to only one flower. The ultimate unit, what one might call the " flower " is therefore in the case of the female unit, a spikelet. These spikelets are usually borne in spikes, which again may be simple spikes or in panicles. The male ' flower ' is regarded by some as a flower quite like that of other Cyperaceæ but by others as a reduced spikelet like the female, but still more reduced for there is no utricle, no trace therefore of the glume. What appears therefore to be spikelet is on this view really a spike of one flowered spikelets, and what appear to be the glumes of the spikelet are in reality the bracts subtending the spikelets on the spike.

This is the view in Engler and Prantl's *Pflanzenfamilien,* and in the *F.B.I.* by C.B. Clarke. In the *Genera Plantarum* the more general view was adopted that the male unit is a flower, and therefore the spike really a spikelet as it looks to be ; but the female unit a reduced spikelet, as now supposed, and the apparent spikelet a spike.

Since for the purposes of a Flora it is of more importance that there should be no mistake on the part of the reader as to what part is being described, than that the correct morphology of the part be indicated, I shall in the following call the ultimate units, "flowers" and drop the word spikelet. My "flowers" then are, in the case of the female, the utricle and its contents with the bract outside, and in the case of the male the stamens and their bract.

In the F.B.I. the genus is divided into two sub-genera I *Vignea* with bifid style, II *Eucarex* with style three-fid, and the species are arranged in sections according to the composition of the spike, whether with male flowers at the top and female below, or vice versa, or unisexual the uppermost spike usually male, the lower only female.

KEY TO THE SPECIES.

a
- Spike long or short, in large open panicles . . . . *h*
- Spikes solitary or few, on radicle scapes 10. C. Jachiana.
- Spikes cylindrical, the uppermost male only . . . . *f*
- Spikes cylindrical mixed, the upper flowers male . . *e*
- Spikes short, mixed in compound spikes 1 to 2 inches long . . . . *b*

b
- Compound spike, short or long, solitary on stem . . *c*
- Compound spikes several on the leafy stems . . . *d*

c
- Compound spike 1 inch, dense; utricle many-veined, bract lanceolate . . . . 1 C. nubigena.
- Compound spike 2 inches, interrupted: utricle smooth, bracts ovate, awned . . . . 2. C. foliosa.

d
- Stigmas 2 . . . . 4. C. brunnea.
- Stigmas 3 . . . . 7. C. Lindleyana.

e
- Spike dense: stigmas 3: utricle beak short . . . . . . 8. C. myosurus.
- Spike long: the flowers separated: stigmas 2, utricle beak long . . . . 3. C. longipes.

f
- Midrib of floral bracts excurrent . . . . *g*
- Bract short, midrib not excurrent: utricle beak short, stigmas 3 . . . . 9. C. maculata.

g { Excurrent midrib broad : utricle beak short : stigmas 2 . 5. C. phacota.
Bract awned : utricle hairy beak long : stigmas 3 . . . 11. C. hebecarpa. }

h { Spike ½ inch, bracts not awned . . . 6. C. filicina.
Spike 2 inches, bracts awned . . . . 12. C. baccons. }

1. **Carex nubigena** *D. Don ; F.B.I.* vi 702, XXVIII 6 ; Stems tufted, leafy only at the base and the tip, and clothed below with short colourless leaves. Leaf-sheath short, scarious at the top and with almost a ligule, like a grass : blade slender, incurved or folded and so appearing less than $\frac{1}{16}$ inch wide ; terminal ones slenderer and shorter, with no sheath, but a scarious sheathing base. Spikes of "flowers" in a more or less compact compound spike ; the end flowers male only, the lower ones female. Anthers two, crested. Bract of the female flowers with a conspicuous double green midrib hardly produced as a bristle. Stigmas 2. Utricle strongly veined along the edges, but without veins on the flat faces. **t. 579.**

In fairly damp places, but not actually in water, often with Hydrocotyle asiatica.

Nilgiris : Ootacamund to Pykara, 6,400 feet and Coonoor, flowering May. Pulneys : below Kodaikanal near Vilpatti ; Kukal.

Gen. Dist. Himalayas, Khasia, Sind, Western Ghauts, Ceylon to Malaya, China and Japan.

2. **Carex foliosa** *D. Don.;* formerly C. muricata *Linn. var* **foliosa** ; *F.B.I.* vi 703, XXVIII 7 b. Similar to C. nubigena but leaves flat. Compound spike 1 to 2 inches interrupted. Bracts usually under 1½ inches. Floral bracts awned. Anthers crested. Utricle smooth.

Pulneys : below the church at Kodaikanal ; Poombari ; Kukal (*Bourne*). Not on the downs. Nilgiris : Ootacamund.

3. **Carex longipes** *D. Don, var.* **dissitiflora** *C. B Clarke ; F.B.I.* vi 705, XXVIII 11 *var.* c. Rhizome short. Leaves nearly flat, the lowest 10 to 18 by $\frac{1}{6}$ to $\frac{1}{4}$ inch, upper smaller : many-ribbed. Stems 6 to 20 inches, leafy. Spikes $1\frac{1}{2}$ to 2 inches, stalked in the axils of the stem-leaves, distant, forming a long lax inflorescence. Floral bracts about $\frac{1}{8}$ inch apart, $\frac{1}{3}$ inch long, finely acuminate, with green many-nerved middle part and hyaline margins. Utricle with its beak $\frac{1}{4}$ inch, sessile in the axil of each bract, many-ribbed.

Pulneys : Gundan shola, Gundattu shola, etc., near Kodaikanal. Kukal.

4. **Carex brunnea** *Thumb. ; F.B.I.* vi 705, XXVIII 12. Spikes several. Rhizome oblique. Stem 1 to 3 feet, slender. Leaves two-thirds as long, $\frac{1}{6}$ inch wide. Stigmas 2.

Nilgiris : Coonoor, Kotagiri.

Gen. Dist. North-Western Himalayas to Japan, Australia and Sandwich Island.

5. **Carex phacota** *Spreng ; F.B.I.* vi 708, XXVIII 23. Spikes cylindrical about 2 by $\frac{1}{6}$ inch, each on a slender peduncle the uppermost male only, the lower female or with the lower flowers female. Upper leaves on bracts of the flower 6 to 8 inches. Utricle not ribbed, rather blunt, when dry chocolate brown. Bracts with broad white or green midrib, the extended part flat-toothed, not like an awn. Stigmas 2. **t. 580.**

6. **Carex filicina** *Nees ; F.B.I.* vi 717, XXVII 51. A tall plant of 3 or 4 feet. Upper leaves 4 to 10 inches acute. Spikes numerous, $\frac{1}{4}$ to $\frac{1}{2}$ inch long each, in

compound panicles of about 2 inches by 1 inch, peduncled in the leaf-axils, the whole formed a large panicle more than half the height of the plant. Stigmas 3. **t. 581.**

On both plateaus: Pulneys near Kodaikanal, Vilpatti, etc.

7. **Carex Lindleyana** *Nees ; F.B.I.* vi 721, XXVIII 63. Rhizome long, woolly, creeping, sheathed by the fibrous remains for the leaf-bases. Leaves flat, $\frac{1}{6}$ inch, finely acute, the lowest 10 to 12 inches: upper, on the stems, shorter. Stems 1 to $2\frac{1}{2}$ feet slender. "Flowers" in dense spikes or spike-like panicles in the axils of the upper (short) leaves. Utricle $\frac{1}{6}$ inch, oblong ellipsoid many-nerved, with linear deeply bifid beak, its bract often scabrid on the keel and short awn; as also are the stalks of the spikes. Stigmas 3.

Pulneys: Kodaikanal lake. Nilgiris, 6,000 to 8,000 feet. *Wight* "frequent."

Gen. Dist. From Khasia hills to Pulneys and Ceylon, China and Japan.

8. **Carex myosurus** *Nees ; F.B.I.* vi 723, XXVIII 68. Spikes about 2 inches long the upper $\frac{3}{4}$ inch (male) distinctly thinner than the lower female. Floral bract $\frac{1}{8}$ inch awned, with three ribs down the centre. Utricle not longer. Stigmas 3. **t. 582.**

Nilgiris: Coonoor. In light shade. These hills only.

9. **Carex maculata** *Boott. ; F.B.I.* vi 735, XXVIII 104. Stem slender. Spikes about 1 by $\frac{1}{6}$ inch, the uppermost male, the lower female only. Utricle reddish brown when dry, strongly three to five veined, broadly ovate with short beak. Style 3.

Nilgiris: Pykara.

10. **Carex Jachiana** *Boott.* ; *F.B.I.* vi 735, XXVIII 106. Spikes unisexual, solitary or a few together, the terminal male, the lower female, ½ to 1 inch, on radicle peduncles of 4 to 10 inches. Leaves much longer, up to 18 inches. Style three-fid. Utricle strongly veined.

Shevaroys.

11. **Carex hebecarpa** *C. A. Mey; var.* ligulata, *F.B.I.* as C. ligulata *Nees*, vi 747, XXVIII 141. Spikes several in a slender inflorescence, the terminal all male. Lower spikes about 1 by ¼ inch, glumes densely hairy or tomentose, with very long beak. Bracts aristate by the extension of the midrib.

Nilgiris : Coonoor in Lamb's Rock Shola. Pulneys : Shembaganur valley.

12. **Carex baccans** *Nees.* ; *F.B.I.* vi 722, XXVIII 67. Rhizome stout. Stem tall with long leaves. Spikes 1½ to 2 inches upper flower male : in a large panicle. Utricle strongly ribbed, beak ultimately quite short, similar in its inflorescence to C. filicina t. 581, but a taller and more robust plant.

Pulneys : Periya shola, Shembaganur valley.

Gen. Dist. Sikkim to Ceylon, and to Java, China and the Phillipine.

GRAMINEÆ.

Grass, Bamboo.

Annual or perennial herbs with round hollow stems and swollen nodes, at which they are often bent abruptly and root near the ground ; often tufted at the base but not usually branching much above ground. Leaves in two opposite rows, clasping the stem by a lower split sheath, and with a narrow free blade, which

has many parallel nerves, and at the junction between sheath and blade a small flap of thin tissue, often reduced to mere hairs, termed the *ligule.* Flowers small and consisting only of three stamens with long anthers lightly attached by the middle to slender filaments, a one-celled ovary with two feathery styles, and in addition two small white bodies, of obscure origin, termed lodicules : these all enclosed between a firm, more or less boat-shaped and ribbed *glume* below, and a thin papery two-nerved *palea* above. One or more such flowers, arranged close above each other in two opposite rows, with a pair of empty glumes (without paleas) at the base and possibly a sterile one at the top, forming a *spikelet.* These spikelets arranged in open panicles, bunches, spikes, or pairs (one of a pair stalked, the other sessile), such spikes or pairs being again arranged in various ways. Fruit a *grain* (one seed enclosed in and inseparable from the wall of the ovary), usually enclosed between the now hardened glume and its palea. Endosperm mealy.

A very large family with about 310 genera and 3,500 species, found in all parts of the world, and often covering large areas. Economically it is perhaps the most valuable to man of all families, the leaves forming the staple food of cattle and horses, the grains of man.

From the CYPERACEÆ the round stem, two ranked leaves and split sheath easily distinguish this family.

The glumes are referred to by their position as numbered in order from the base of the spikelet. Thus glumes i and ii are the two sterile glumes, gl. i being always on the outer side of the spikelet, gl. ii on the inner side, next the axil which bears it. Glumes iii, iv, v, etc., are the flowering glumes, iii being vertically above i, iv above ii, v above iii and so on. One or more of the glumes may have as a prolongation of its tip, or attached to the back, a slender spine (*awn*), which is often bent and by its hydroscopic twistings buries the grain (enclosed in the glume) in the soil or the coat of some passing animal (cf. Herons-bill, p. 70). The stalk of the spikelet itself on which the glumes are set is called the *rachilla.*

KEY TO THE GENERA.

a.
- Spikelets jointed to their stalks, except ARUNDINELLA, so that the two lowest glumes come away with the grain (never more than one). Flowers one or two, but if two, the top one alone fertile. See also *j* CALAMAGROSTIS . . . . . . *A. PANICACEÆ* . . *b.*
- Spikelets not jointed to their stalks, so that the two lowest glumes remain attached to it, while the rachilla breaks, if at all, above the empty glumes. Flowers one, two or more. See also *e* ISACHNE . *B. POACEÆ* . . *e.*

A. PANICACEÆ.

b.
- Spikelets all equal in spikes or panicles. Glume iii in fruit usually equal to i and ii in hardness, though often much larger . . . . (PANICEÆ) . *c*
- Spikelets in sets of two, unequally stalked, or at the top of the spike a set of three. Glume iii, and iv if it occurs, hyaline, so that the spikelet may appear to have only two glumes and one or more paleas. (ANDROPOGONEÆ) *h*

c.
- Spikelets awned or with bristles . . . . *f*
- Spikelets not awned . . . . *d*

d.
- Panicles open, loose : spikelets globular. *p.* 654. ISACHNE.
- Spikelets in spikes, radiating or in a contracted panicle (cat's-tail) . . . . *c*

e.
- Spikelets compressed against an indented axis . PASPALUM.
- Spike radiating or in "a cat's-tail". *p.* 656. PANICUM.

f.
- Spike simple : spikelet with long bristles at base . . . *p.* 661. SETARIA.
- Spikelets in a panicle or branched spike . . . . *g*

g.
- Spikes short, panicled, gl. i and ii longest ; hairy . . . *p.* 659. ARINDINELLA.
- Panicles loose, gl. i minute or o, ii = iii silky . . . . . *p.* 658. TRICHOLÆMA.

h.
- Spikelets in 3's in an open panicle p. 666. CHRYSOPOGON.
- Pairs of spikelets in one-sided spikes . . . . . . *i*
- Pairs in wedge-shaped bunches in axils of bracts . . . *p.* 670. ANTHISTIRIA.

i Spikes solitary, awns long twisted together . . . . *p.* 667. HETEROPOGON.
Spikes in pairs, in axils of bracts *p.* 668. CYMBOPOGON.
Spikes 2 or more at top of stem . . . . *j*

j Spikes 2 only, unequally stalked : stem red . ISCHÆMUM.
Spikes 2 equally stalked, or many racemed . . . . *p.* 665. ANDROPOGON.
Spikes usually 4, very silky . . *p.* 662. POLLINIA.

k Spikelets short, of 1 or 2 pairs of visible glumes . . *l*
Spikelets of 3 or more pairs of visible glumes or long . *n*

l Spike slender of few spikelets ; a swamp grass . . . . *p.* 673. CŒLACHNE.
Panicle narrow, of short erect spikes *p.* 672. SPOROBOLUS.
Panicle loose . . . . *m*

m Gl. i shorter than ii, iii and iv bifid, both awned . . . *p.* 671. ANTHOXANTHUM.
Gl. i and ii equal, iii enclosed, awned . CALAMAGROSTIS.
Gl. i and ii equal, half iii and iv, no awns . . . . . . *p.* 673. ZENKERIA.

n Spikes short erect, in narrow raceme ; glumes 3-awned *p.* 675. TRIPOGON.
Spikelets panicled or in simple spike . . . . *o*

o Spikelets awned . . . . *p*
Spikelets not awned . . . . *s*

p Awn bent, glumes keeled . . . . *p.* 674. AVENA.
Awn straight, glume round-backed, veined or not . *q*

q Spike simple : spikelets erect . *p.* 681. BRACHYPODIUM.
Spikelets pedicelled in panicles . . . . *r*

r Flowering glume veined, notched at insertion of awn . *p.* 680. BROMUS.
Flowering glume smooth, not notched *p.* 680. FESTUCA.

s Glumes rounded, many veined, spikelets fat : panicle very loose . . . . *p.* 678. BRIZA.
Glumes 3-veined : often dark . *p.* 676. ERAGROSTIS.
Glumes 5-veined, green . . . . *p.* 679. POA.

PASPALUM. F.B.I. 1731.

Spikelets one-flowered flattened, against the axis of the spike, jointed to their pedicels. Two outer empty

glumes equal in length and completely enclosing the rest ; inner flowering glume and palea alike thin, papery, but ultimately becoming hard. Grain ovoid, enclosed in the hardened glume and palea.

Species 160, in the tropics of both hemispheres, but chiefly in America, where in the temperate parts they form an important part of the Rampos grass.

Paspalum Perrottetii *Hook. f.* ; *F.B.I.* vii 20, I 15. Stem creeping below, very variable in height, 6 to 24 inches much branched below. Leaves 2 to 6 inches by $\frac{1}{4}$ to $\frac{1}{3}$ inch, glabrous or hairy. Sheaths $1\frac{1}{2}$ to 2 inches. Ligule $\frac{1}{8}$ inch, scarious. Panicle 2 to 4 inches, of four or five whorls of slender spikes. Spikelets in pairs with unequal stalks so as to be distributed evenly along the spike : glume i $\frac{1}{12}$ inch, seven or nine nerved ; gl. ii nearly as long seven to nine nerved ; gl. iii nerveless smooth.

Nilgiris : Ootacamund. Pulneys : at 5,000 feet. Not collected above.

Gen. Dist. Also Ceylon, North Africa.

ISACHNE. F.B.I. 173 III.

Perennial grasses. Spikelets well separated on the radiating branches of a large panicle, globular or elliptic, two-flowered and differing from those of all the other Panicaceæ in not being jointed to the pedicel below the lowest glumes, but above the first pair as in the Poaceæ. Two first glumes nearly equal. Two flowering glumes, thin but hardening in fruit and with the hardened paleas enclosing the hemispherical grain.

About 20 species, widely distributed in the warmer parts of the world, more especially Asia, Africa and across to Australia and Japan ; rare in America.

a Glumes i and ii longest : spikelets hairy . I. Kunthiana.
Glume iii longer than iv ; glumes i and ii shorter : glabrous . . *b*

b Spikelet $\frac{1}{8}$ inch ; pedicels $\frac{1}{8}$ to $\frac{1}{4}$ inch . . I. australis.
Glume i much shorter than ii and iii. Leaves $\frac{1}{2}$ inch broad. Spikelet $\frac{1}{6}$ inch on long pedicels . . . I. Gardneri.

Isachne Kunthiana *W. and A. ; F.B.I.* vii 21, III 1. Leaves lanceolate up to $2\frac{1}{2}$ by $\frac{3}{4}$ inch. Spikelets $\frac{1}{8}$ to $\frac{1}{6}$ inch. Outer glumes (i and ii) acuminate, longer than the inner, purple, three or five veined, covered with hairs on bulbous bases. Glumes iii and iv (enclosing the grain) shorter, white : exposed between the parted outer glumes and making the spikelets purple and white. **t. 583.**

Pulneys : on margins of water and in other cool or moist places near Kodaikanal, and below. Nilgiris : sholas near Ootacamund.

Gen. Dist. Nilgiris and Travancore hills 6,000 to 8,000 feet. Ceylon, Singapore, Java, Borneo.

Isachne australis *Br. ; F.B.I.* vii 24, III 12. A more slender plant than the last, hairy, stems ascending, rooting often at the lower nodes. Leaf-blades lanceolate, $2\frac{1}{2}$ by $\frac{3}{8}$ inch or less, softly hairy on both sides, with numerous obscure nerves and hardly distinguishable midrib ; ligular hairs $\frac{1}{8}$ inch ; sheath also ciliate. Panicle about 3 by 2 inches ; pedicels $\frac{1}{30}$ to $\frac{1}{10}$ inch (the spikelets often in pairs unequally stalked), hardly thickened at the top. Spikelets globose, purplish, $\frac{1}{10}$ inch. Glumes all approximately equal ; i and ii obscurely seven or nine veined, purple with a few white hairs towards the upper half ; iii nearly glabrous and nerveless, concave with stamens only ; iv similar, but more pubescent on the back, with stamens and ovary ; paleas in both nerveless, not cross-ribbed, nearly opaque. **t. 584.**

In moist ground. Nilgiris: Ootacamund. Pykara. Flowering May, after rains. Pulneys: by the lake at Kodaikanal, Silver Cascade, etc.

Gen. Dist. India from Assam to Ceylon and Burma, and on to Australia and New Zealand.

Isachne Gardneri *Benth.; F.B.I.* vii 26, III 16. Stem 2 to 3 feet. Leaf-blades 3 to 5 inches by ½ to ¾ inch *near the base, lanceolate acuminate.* Panicle 4 *to 6 inches* high and wide: its branches very slender, not much divided. Spikelet ⅙ inch, few on stalks (branches of panicle) of ¼ to 1¼ inches. Glume i three-nerved: gl. ii longer, five-nerved; gl. iii smooth. **t. 585.**

Pulneys: in sholas on the downs near and above Kodaikanal. Nilgiris: Coonoor. Ootacamund.

Gen. Dist. South Indian hills at 6,000 feet, etc., Ceylon.

PANICUM. F.B.I. 173 IV.

Spikelets two-flowered, the upper flower alone seeding. Glume i very small: gl. ii and iii nearly equal, many-nerved: gl. iv glabrous, shorter than the others, and with the palea enclosing the grain as a hard skin.

A large genus of about 300 species, common in all the warmer parts of the world, but rare in Europe and north temperate America.

KEY TO THE SPECIES.

Spikelets massed in a dense apparent spike . P. indicum.
Spikelets in short spikes, racemed . . . P. villosum.
Spikelets in open much-branched panicle, sessile, narrow . P. repens.
Spikelets pedicelled in a small panicle, roundish . P. patens.

Panicum villosum *Lamk.; F.B.I.* vii 34, IV 10. Stems prostrate hairy. Leaves ovate-oblong, densely pubescent *on both* surfaces. Spikelets irregularly

arranged on the branches of a narrow panicle, very small. Glume i very short, nerveless ; gl. ii ovate acute seven-nerved ; gl. iii ovate-oblong ; gl. iv. abruptly apiculate. t. 586.

Nilgiris : Coonoor by roadsides in shade, Kotagiri, Pulneys, Kodaikanal.

Panicum indicum *Linn., var.* **gracile** ; *F.B.I.* vii 41, IV 23. Spikelets lanceolate acute, two-flowered : crowded into a dense cat's tail-like spike, 3 inches by $\frac{1}{3}$ inch. Glume i very much shorter than the others, many-ribbed : gl. ii seven to nine nerved : gl. iii three-nerved : palea of gl. iii minute, with stamens only : gl. iv glabrous, shiney, much smaller, and tightly fitting round the grain as it ripens.

Pulneys near Kodaikanal in river-beds. *Bourne.*

Gen. Dist. (of species). Sub-tropical and tropical India from Gharwahl eastwards and southwards, Ceylon, tropical Asia and Africa.

Panicum repens *Linn. ; F.B.I.* vii 49, IV 37. A tallish, stout grass, growing in water, with creeping rhizome. Leaves 3 to 6 inches by $\frac{1}{4}$ inch at base, tapering to a fine point, often bluish, with sometimes a few bristle-teeth at the base : sheath ciliate : ligule a narrow thick ring. Spikelets $\frac{1}{8}$ inch, sessile or nearly so on the short branches, two or three together, of the compound panicle. Glume i very short and roundish, $\frac{1}{6}$ of gl. iii ; gl. ii or iii subequal, five-veined ; gl. iii male or neuter ; gl. iv ovate-acute, smooth. Anthers red.

Nilgiris : Kotagiri. Pulneys : Kodaikanal. Shevaroys : in swamp on Green Hills.

Gen. Dist. Throughout India from the Punjab southwards and westwards to South Europe, Africa and America.

Panicum patens *L. ; F.B.I.* vii 57, IV 52. Creeping stem thin. Leaves 1 to 3 by $\frac{1}{6}$ to $\frac{1}{4}$ inch lanceolate

narrowed at base. Panicle 2 to 6 inches, its branches slender. Pedicels $\frac{1}{8}$ to $\frac{1}{6}$ inch. Spikelets $\frac{1}{16}$ to $\frac{1}{12}$ inch hemispherical, compressed laterally: gl. i thin, $\frac{2}{3}$ of iii, gl. ii. gibbous, gl. iii three-veined.

Nilgiris: Kotagiri, in Longwood shola. Pulneys: on lower slopes.

Gen. Dist. Tropical India, Ceylon, Malaya and Pacific Islands.

TRICHOLÆMA.

Weak-stemmed narrow leafed grasses with panicles of very silky spikelets, in which glume i; is very small, sometimes well below gl. iii.; gl. ii and iii boat-shaped silky; gl. iv with a palea and three stamens between: iv half as long, transparent like a palea, with female bisexual flower.

Species 10, chiefly in Africa. T. rosea is cultivated in gardens.

Tricholæma Wightii. *Nees and Arn.; F.B.I.* vii 65, X 2. Stem 2 to 3 feet glabrous but for a few scattered hairs on lower parts. Leaves 2 to 6 inches thin. Ligule as a row of bristle. Panicle 6 to 12 inches pinkish, very silky. A beautiful grass.

Shevaroys: Yercaud; flower June.

OPLISMENUS. F.B.I. 173 XI.

Weak-stemmed grasses with thin flat leaves and one-flowered spikelets in twos and threes along simple or compound spikes, and remarkable for the long awn attached to glume i and the shorter awns to gl. ii and iii.

Species perhaps only 4 but as many as 30 described in tropical and sub-tropical zones.

Leaves five or six times as long as broad . O. undulatifolius.
Leaves three or four times as long as broad . O. compositus.

Oplismenus undulatifolius *Beauv.; F.B.I.* vii 66, XI 1. Stem 1 to 1½ feet, slender. Leaf-blades 1¼ to 2 by ⅓ to ¼ inch, lanceolate acute; sheath ½ to ¾ inch; ligule a mere ridge. Spike simple, terminal, 2 to 5 inches. Spikelets three or four together. Glume i three-nerved, its awn ¼ to ⅔ inch, firm, not subulate: gl. ii five-nerved, its awn much shorter: gl. iii seven-nerved, also awned. **t. 587.**

Pulneys: by the lake side at Kodaikanal. Nilgiris.

Gen. Dist. Cooler parts of India and to Central and Southern Europe.

Oplismenus compositus *Beauv.; F.B.I.* vii 66, XI 2. Very similar to the last but the spike compound, i.e., the spikelets in short spikes of ½ inch or more, as side branches of the main spike: and leaves broader.

Nilgiris: Kotagiri.

Gen. Dist. Throughout India and most tropical regions (except Australia).

ARUNDINELLA. F.B.I. 173 XII.

Erect grasses with narrow leaves, and panicles composed of spikes of one or two flowered spikelets, which are not jointed to their stalks, but in the middle below the fertile glume iv. Glume i three or five nerved; gl. ii slightly longer, five-nerved; gl. iii empty or with stamens only, thin, five or seven nerved; gl. iv with stamens and ovary, smaller than the others, awned or not, usually bearded at the base. Grain free within it.

Species about 24, in the tropics of the Old World, few in America.

a { Glume iv with two short awns and a longer middle one . b
Glume iv with one awn only c

b { Branches of panicle with spikelets to the base . . . . 1. A. mesophylla.
Branches naked near the base. Perennial grass. . . . 2. A. setosa.

c { Leaves $\frac{1}{3}$ to $\frac{1}{6}$ inch wide . . . . . . 3. A. villosa.
Leaves $\frac{1}{4}$ inch wide. Spikelets along one side of the branch, often in pairs . . . . 4. A. fuscata.

1. **Arundinella mesophylla** *Nees ex Steud., Herb. Wight. Prop.* 2347 *! ; F.B.I.* vii 69, XII 3. Annual. Stem 1 to 2 feet, hirsute or pubescent. Leaves 1$\frac{1}{2}$ to 4 by $\frac{1}{6}$ to $\frac{1}{4}$ inch, hirsute narrowed to the base: ligule obscure. Panicle purple, hairy, its branches (spikes) $\frac{3}{4}$ to 1 inch, erect, flowering to the base. Glume i ovate, hirsute, three-nerved, hardly awned ; gl. ii rather longer, five to seven nerved, narrowed into a beak ; gl. iii obtuse ; gl. iv lanceolate, pilose at the base, with a medium awn as long again as the spikelet, and two much shorter lateral ones.

Nilgiris : Biccapatti and eastern plateau. Pulneys : on the hills above Kodaikanal.

2. **Arundinella setosa** *Trin. ; F.B.I.* vii 70, XII 5. Rootstock hard, perennial. Stems densely tufted, 2 to 3 feet, leafy. Leaf-blades 3 to 5 by $\frac{1}{4}$ inch, not flat ; sheaths 2 to 3 inches : ligular hairs $\frac{1}{8}$ inch. Panicle 2 to 6 inches, the spikes (branches) 1$\frac{1}{2}$ to 2 inches, bare at the base. Glume i about $\frac{1}{6}$ inch acuminate, three-nerved : gl. ii five-nerved, also acuminate ; gl. iii much shorter obtuse, five to seven nerved ; gl. iv $\frac{1}{2}$ to $\frac{2}{3}$ of iii with two short straight awns, and a central long bent one, with the upper part beyond the bend as long as gl. i.

Pulneys : near Kodaikanal and below. Nilgiris : Ootacamund.

Gen. Dist. Higher hills of India and Ceylon.

3. **Arundinella villosa** *Arn. ex Steud., Herb. Wight Prop.* 2037, *var*, **Heyne**, *Wall. Cat.* 8663 A ; *F.B.I.* vii 72, XII 11. A coarse grass, hairy all over. Stem 12 to 16 inches, very leafy at the base. Leaves 6 to 12 by $\frac{1}{6}$ to $\frac{1}{3}$ inch, villous ; but basal sheaths glabrous. Panicle 4 by $\frac{1}{2}$ inch, soft ; in fruit $1\frac{1}{2}$ inches wide. Glume i hirsute with hairs from bulbous bases along the margin and the four nerves ; gl. ii similar and longer ; gl. iii glabrous, five-nerved ; gl. iv hirsute at the base, notched at the insertion of the awn ; awn twisted, longer than but not twice as long as the flower. **t. 588.**

Pulneys : (Wight Kew Dist. 1871). Nilgiris : on the downs.

Gen. Dist. Central India, Khasi hills, east Himalayas, South India, Ceylon.

The species was founded on a Ceylon plant.

4. **Arundinella fuscata** *Nees ; F.B.I.* vii 74, XII 14. Perennial. Stem 1 to 2 feet, stiff, quite glabrous. Leaves mostly near the base ; blades 2 to 5 by $\frac{1}{4}$ to $\frac{1}{2}$ inch, flat, hairy, tapering from base to tip. Panicle $2\frac{1}{2}$ to 5 inches, dense, its branches (spikes) stiff, erect, 1 to $1\frac{1}{2}$ inches. Spikelets crowded along one side only of the spike, often in pairs of which one has a longer stalk than the other. Glume i artistate three-nerved ; gl. ii five-nerved; gl. iii obtuse as long as i ; gl. iv with slender awn, $\frac{1}{8}$ inch long beyond its bend. **t. 589.**

Nilgiris : on the downs near Ootacamund. Pulneys : on the downs above Kodaikanal and down to Silver Cascade.

Gen. Dist. Western Ghauts and Pegu.

SETARIA. F.B.I. 173 XIII.

Spikelets one to two flowered, unawned, crowded in a dense (really compound) spike, and each surrounded by a ring of bristles.

Species few.

Setaria glauca *Beauv.*; *F.B.I.* vii 78, XIII 2. Stem 1 to 2 feet. Leaves broad or narrow, flat.

Spike ½ to 7 inches long, ovoid to cylindrical, bristly the spikelets each with 6 to 12 slender barbed bristles, Glume i minute; gl. ii shorter than iii which is empty or with stamens only; gl. iv broadly ovoid, very convex and transversely ridged. **t. 590.**

In grass, especially in gardens, etc.

Gen. Dist. Throughout India.

POLLINIA. F.B.I. 173 XXXIV.

Spikelets in pairs, one stalked, the other sessile, in spikes which radiate out from the top of the stem; both kinds one-flowered, bisexual; or the sessile one two-flowered. Glume i thin, but hard, with thickened edge. Glume ii three-nerved, often thinner, boat-shaped. Glume iii very thin and papery with a minute palea at its base. Glume iv reduced to a small thin papery enlargement of the base of the awn. Stamens three. Ovary oblong with two distinct styles and feathery stigmas. Grain included in the outer glumes.

Species about 30, in the tropics of Asia, Africa and Australia.

The third glume is so thin that it may well be mistaken for a palea, and the palea that belongs to it is difficult to make out because closely appressed to it and very small. See figure.

Lowest leaves brown-tomentose at the base. . P. phæothrix.
Stem, etc., glabrous at the base . . . . . P. quadrinervis.

Pollinia quadrinervis *Hack, var.* **Wightii**; *F.B.I.* vii 110, XXXIV 3. A strong growing grass, with stem 1½ to 3 feet and leaves 15 inches by ⅓ inch and radiating, spikes of 3 to 5 inches. Stem glabrous. Leaf-blades hirsute with hairs from bulbous bases: ligular hairs ⅛ inch; sheath 3 to 6 inches. Spikes softly hairy on rachis,

stalks of spikelets, and margins of the outer glumes. Spikelets $\frac{1}{5}$ to $\frac{1}{4}$ inch, oblong-lanceolate, subacute. Glume i concave or grooved down the back, with four obscure nerves visible from the inside, glossy and glabrous except for the long white hairs on the lateral pair of nerves where it is folded in like a palea : gl. ii smooth, ciliate on the margins : gl. iii hairy above : gl. iv with awn of $\frac{3}{4}$ inch, bent and twisted. **t. 591.**

Pulneys : on the slopes above Kodaikanal.

Gen. Dist. Sub-tropical Himalayas, Pegu, China.

The tip of glume i is greenish, the rest pinkish, giving the spike an irredescent appearance. "Phyllis' pigtails" has been suggested as a 'popular' name on account of its resemblance to plaited hair.

Pollinia phæothrix *Hack ; F.B.I.* vii 112, XXIV 9. Stems $1\frac{1}{2}$ to 2 feet, clothed at the base with rust-coloured tomentose sheaths. Leaf-blades slender, 6 to 18 inches, acuminate, hairy on the back. Spikes, 2 to 4 inches golden brown in colour, softly hairy, with hairs along the rachis, stalks of spikelets and backs of glume i. Spikelets $\frac{1}{4}$ to $\frac{1}{5}$ inch. Glume i densely clothed with hairs on the marginal nerves ; gl. ii nearly glabrous but for hairs above the middle ; gl. iii nerveless, ciliate on the obtuse tip ; gl. iv shorter, with awn inserted in the cleft. "Auburn tresses." **t. 592.**

Nilgiris : on the open downs, round Ootacamund and beyond Avalanche. Pulneys : about Kodaikanal, a beautiful grass ; flowering September.

Gen. Dist. Also Ceylon and Tonkin.

ISCHÆMUM. F.B.I. 173 XXXVII.

Annual or perennial grasses with rather broad leaves. Spikelets in pairs, one-stalked, the other sessile, two-flowered, in dense spikes radiating from the top of the stem. Sessile spikelet with one fertile flower, the top one, and a

staminate flower : stalked spikelet with two staminate flowers, neither as a rule having an ovary.

Species about 34 chiefly tropical monsoon regions, rare in Africa and America.

Ischæmum ciliare *Retz.* ; *F.B.I.* vii 133, XXXVII 16 ; the Purple Grass of the hills.

Leaves coarse, lower sheaths much compressed ; blade 2 by $\frac{1}{3}$ inch, elliptic acute, softly hairy all over : ligule $\frac{1}{10}$ inch high, triangular : nodes ciliate. Flowering stem slender, purplish upwards. Spikes two, diverging : one stalked $\frac{1}{6}$ inch beyond the other, purple except for the white hairs on the outer glumes. Sessile spikelet ; glume i obovate, $\frac{1}{6}$ inch, notched two-winged upwards and clothed with white hairs from the base ; gl. ii boat-shaped, very stiff, keeled and crested at the top ; gl. iii thin, reddish, not ribbed, with stamens and a tiny pistillode ; palea thin obscurely two-ribbed ; gl. iv enclosing a perfect flower, bifid, ciliate, with a long $\frac{1}{2}$ inch awn attached about half-way. Stalked spikelet : gl. i strongly one-nerved, not bifid or winged : otherwise similar. **t. 593.**

On the open downs of both plateaus.

Gen. Dist. From Nepal and Bengal southwards to Ceylon and on to Malaya, China and Australia.

ANDROPOGON, Etc. F.B.I. 173 LIII.

Spikelets one-flowered, in pairs. Lower, sessile, spikelet of each pair female or bisexual ; upper, stalked, spikelet male only. Pairs of spikelets arranged in spikes, and these in various ways.

A large group of 200 or more species, chiefly in tropics. In the F.B.I. all placed in one big genus, with several sub-genera, but some of these may more conveniently be treated as distinct genera as under for our species.

Spikes (of paired spikelets) panicled . *p.* 666. CHRYSOPOGON.
Spikes two or more, not in a bract . *p.* 665. ANDROPOGON.
Spikes paired in the axils of bracts : scented grasses . . . *p.* 668. CYMBOPOGON.
Spike solitary at the end of the stem . *p.* 667. HETEROPOGON.

ANDROPOGON.

Spikes 2 or more in a fascicle or panicle. Pedicels of upper spikelets narrow, channelled and translucent. Sessile spikelet dorsally compressed .Pedicelled spikelet narrow, many-veined.

Species about 280 all over the world.

Andropogon Foulkesii *Hook. f., Foulkes "on Kaity Brow!" ; F.B.I.* vii 174, LIII 19. Stem 8 to 18 inches, very slender glabrous : rootstock perennial. Leaves 3 to 10 inches by $\frac{1}{6}$ to $\frac{1}{2}$ inch, finely acuminate, hispid with spreading hairs ; midrib strong : mouth of sheath and ligule villous with long hairs. Spikes 1 to 2 inches, on slender stalks of $\frac{1}{4}$ to $\frac{1}{2}$ inch ; axils bearded with long soft hairs. Spikelets purple. Glume i with about nine obscure or evident nerves ; gl. ii three-nerved, keel scabrid towards the top, margin ciliate ; gl. iii hyaline, without nerves ; gl. iv of sessile spikelet with awn of $\frac{1}{2}$ to $\frac{3}{4}$ inch. Stalk of pedicelled spikelet with long hairs : glumes i and ii much as in the sessile. **t. 594.**

Nilgiris : on the downs near and below Ootacamund—Pykara, Kaity, etc. Pulneys : near Kodaikanal and down to 5,500 feet at Periya Shola.

Not reported from elsewhere.

Andropogon micranthus *Kunth. ; F.B.I.* vii 178, LIII 29. Stem 2 to 3 feet. Leaves 6 to 12 by $\frac{1}{6}$ to $\frac{1}{4}$ inch, flat, more or less hairy. Spikes short, $\frac{1}{5}$ to $\frac{1}{3}$ inch, of two or three, spikelets in a pyramidal panicle 2 to 6

inches high, pale yellow violet or red brown. Spikelets about $\frac{1}{6}$ inch bearded on the basal callus. Glume. i five-veined. Awn of gl. iv $\frac{1}{2}$ inch. Male (pedicelled) spikelet not awned.

Pulneys : Periya Shola below Kodaikanal.

Gen. Dist. Western Himalaya, Khasia, Deccan, Nilgiris, Eastern Asia and Malayas, South Africa, Australia.

CHRYSOPOGON. F.B.I. vii *p.* 187.

Tall handsome grasses with open panicles of spikelets in threes, the middle spikelet sessile and fertile, the lateral pedicelled and sterile.

Species about 12 in the warmer parts of both Old and New Worlds.

{Stigmas yellow : awn 2 inches, red . C. Wightianus,
{Stigmas purple : awn 1 inch. . . . C. zeylanicus.

Chrysopogon Wightianus *Nees* (Andropogon Wightianus *Steud.*) ; *F.B.I.* vii 191, LIII 48. Remarkable for the red or purple glumes against which the yellow anthers and stigmas are conspicuous and long bent awns.

Stems tufted 2 to 3 feet, from a short rootstock leafy. Leaf-blades 3 to 10 inches, glabrous or pubescent, with a few scattered long hairs on the margin near the base : ligule very short, villous. Panicle 8 by 7 inches ; branches whorled, very slender, $\frac{1}{2}$ to 1 inch, each with one set only of three spikelets, or bifurcating and bearing two sets, pubescent at the base and forking, and clothed with erect red hairs under the spikelets, or also on the stalks of the stalked spikelet. Sessile spikelet $\frac{1}{4}$ inch, pale yellow : glume i round backed, obscurely two-nerved, glabrous up to above the middle, then hairy, surrounded at the top by a hyaline wing ; gl. ii keeled and with slender $\frac{1}{2}$ inch awn ; gl. iv with stout awn 2 inches long, bent at the middle.

Stalked spikelets ½ inch, red ; gl. i seven-nerved, purple between with longer awn ; gl. ii three-nerved, green with purple patch, margin ciliate with awn as long or shorter ; gl. iii two-veined, retrorsely ciliate ; gl. iv hyaline, without veins.

Pulneys : in and near Kodaikanal and on the downs by woods. Nilgiris : Naduvattam : and down to the plains at Madras.

Chrysopogon zeylanicus *Th.* (Andropogon zeylanicus *Nees.*) ; *F.B.I.* vii 192, LIII 50. Rootstock stout, whole plant pubescent. Leaves 10 to 15 inches, narrow pubescent, and margin ciliate : sheaths 3 to 4 inches, the lower flattened and keeled. Panicle 6 by 3 to 4 inches. Branches very slender, nearly glabrous, green and bluish, villous with rusty brown hairs under the spikelet. One awn only to the set. Sessile spikelet : glume i round-backed, scabrid near the tip, two-ribbed, minutely two-toothed ; gl. ii one-ribbed, awnless, mucronate ; gl. iii purplish ; gl. iv with slender awn 1¼ inches. Pedicelled spikelet : gl. i seven-ribbed, three lateral veins very near the edge and close together ; gl. ii hyaline, three-veined ; gl. iii purplish down the middle with two obscure veins ; gl. iv small, hyaline veinless ; stigma dark purple. The outer purple and green inner sides of the spikelets give to the whole panicle a mixed purple and pale greenish colour. **t. 595.**

Pulneys : round Kodaikanal and on the downs. Nilgiris near Ootacamund. Also Ceylon.

HETEROPOGON. F.B.I. vii *p.* 199.

Spikes solitary. Sessile spikelets sub-cylindric, concealed by the pedicelled : stalks of latter not grooved.

Species under 10, in the tropics.

Heteropogon contortus *Beauv.* (Andropogon contortus *Linn.*) ; *F.B.I.* vii 199, LIII 63. Stem about 1 foot, densely tufted. Leaf-blades $1\frac{1}{2}$ to 3 inches, rather rigid, mouth of sheath with long hairs : no membranous ligule. Spike 1 to 2 inches of eight to eleven pairs of flowers, and a terminal solitary sessile spikelet. Sheath of pedicelled spikelet very short. Spikelets, $\frac{1}{3}$ inch : glume i many-nerved with hairs on swollen base. Glume iv of sessile spikelet with hirsute awn 2 inches long. Distinct from all other of our grasses by its grey curved spike which ends in a fine point formed by several awns twisted together. **t. 596.**

Nilgiris : Abundant all over the downs. Flower June. Pulneys : Kodaikanal on the downs.

Gen. Dist. Throughout India. The common " Spear grass."

CYMBOPOGON. F.B.I. vii *p.* 202.

Coarse strongly scented grasses with spikes (of paired spikelets) paired in the axils of sheathing bracts. Spikes (of a pair) similar, or one stalked, the other sessile. In each spike the lowest pair of spikelets similar, male or neuter : of the other pairs, the sessile (female) spikelet flattened back and front. gl. i with a pit or hollow at the back ; gl. ii acute or awned, gl. iv awned.

Species about 60 in the tropics. Characteristic of the Savannahs of South Africa.

KEY TO THE SPECIES.

a { Stem 1 to 2 feet : spikes two only, terminal . C. lividus.
  { Stem 3 to 4 feet : pairs of spikes panicled . . . . *b*

b { Glume i of sessile spikelet deeply grooved at the base . . C. polyneuros.
  { Glume i not deeply grooved . . . . C. confeetiflorus.

Cymbopogon polyneuros *Stapf* (Andropogon polyneuros *Steudel*), Hohenacker 933 ! ; *F.B.I.* as Andropogon schænanthus *var.* versicolor *Hack.*, vii 205, LIII 71 ; Wild Rusa oil or Geranium grass.

A coarse tufted strongly scented grass variegated green and purplish. Stem 3 to 4 feet. Leaves with rounded base. Panicle 6 inches ; sheath 1 inch, coloured green and blackish. Spikes $\frac{3}{4}$ by $\frac{1}{6}$ inch, at length divergent. Spikelets $\frac{1}{5}$ inch, rachilla and stalks very hairy. Male spikelet : stalk bearded and expanded above into a thin oblique membranous cup ; glume i with nine strong, broad veins and with a deep indentation in the lower half ; gl. ii. one-nerved, ciliate ; gl. iii hyaline with ciliate margin. Female spikelet : gl. ii with a narrow wing attached at the back. **t. 597.**

Nilgiris : on the downs all over from Ootacamund to Pykara. Pulneys : one of the common coarse grasses of these hills.

Cymbopogon confeetiflorus *Stapf* (A. nilagiricus *Hochst.*) ; *F.B.I.* as A. nardus *var.* nilagiricus, vii 206, LIII 72 ; Wild Citronella grass.

Stem 3 to 4 feet. Leaves 2 to 4 by $\frac{1}{4}$ to $\frac{2}{3}$ inch, glaucous beneath : ligule firm. Panicle 10 to 12 inches. Spathes (subtending pairs of spikes) $\frac{1}{2}$ inch, acuminate. Glume i of sessile spikelet flat or with a shallow, not deep, groove in the lower half. Awn of glume iv $\frac{1}{3}$ inch, slender.

Pulneys : in and round Kodaikanal. Nilgiris : at lower levels.

Cymbopogon lividus *Stapf* (Andropogon lividus *Thwaites*) ; *F.B.I.* vii 209, LIII 77 ; Purple grass.

Stem $1\frac{1}{2}$ to 2 feet, tufted, smooth, slender but rigid. Leaf-blades 2 to 5 inches, acuminate, stiffly erect, many-nerved, nearly glabrous : ligule $\frac{1}{8}$ inch. Spikes (of

paired spikelets) two, one with stalk of $\frac{1}{6}$ inch, the pair subtended by a $\frac{1}{2}$-inch acuminate bract. Rachis and stalk of spikelets hairy. Lowest pair of spikelets awnless and infertile. Of the other pairs : sessile spikelet $\frac{3}{8}$ inch ; glume i obscurely two-toothed and two-veined, with a very narrow scabrid wing hollowed at the base where the edges are incurved ; gl. ii one-veined, ciliate, mucronate or shortly awned ; gl. iv, with slender awn. Pedicelled spikelet : gl. i many-veined, glabrous ; gl. ii three-veined, ciliate shorter ; gl. iii hyaline. **t. 598.**

Nilgiris and Pulneys on the open downs, from July to September.

ANTHISTIRIA. F.B.I. 173 LIV.

Tall grasses with narrow leaves. Spikelets one-flowered, in spikes or bunches of six to eleven, each bunch with a large empty spathe-like bract at the base, then a ring of four male spikelets without awns, and above them a set consisting of a sessile female awned spikelet and one or two stalked male ones ; or sometimes with two such sets, except that the upper has two male spikelets the lower only one. The spikes or bunches are again bunched in the axils of large spathes.

Species few in the warmer parts of the Old World.

Easily distinguished from all our other genera by the compound bunches of spikelets.

KEY TO THE SPECIES.

a	One sessile spikelet only to the bunch	*b*
	Sessile spikelets two	A. tremula.
b	Perennial : bracts with long hairs on bulbous bases . .	A. ciliata.
	Annual : bracts nearly glabrous	A. imberbi.

Anthistiria imberbis *Retz.* ; *F.B.I.* vii 211, LIV 2. Perennial much less hairy than the next and with larger stouter spikelets, and awn 1 to 2 inches.

Nilgiris : Ootacamund, flower autumn.

All over hotter parts of India ; and of the world generally.

Anthistiria ciliata *Linn.* ; *F.B.I.* vii 213, LIV 4. A tall annual grass, very variable in size, often scrambling up bushes. Leaf-blades 4 to 15 inches, ciliate near the base with hairs on bulbous bases. Outer spathes 1 to 3 inches ; bracts of spikes clothed with similar bristles. Spike or bunch of spikelets ½ inch long. Awn of female spikelet stout, ⅝ inch. **t. 599.**

On the downs near Ootacamund and above Kodaikanal.

Gen. Dist. North-west India ascending to 7,500 feet. Bengal, Malabar, etc.

Anthistiria tremula *Nees.* ; *F.B.I.* vii 244, LIV 6. A more slender grass than the last, and the wedge-shaped bunches smaller, ¼ to ⅜ inch long but with a double set of sessile and pedicelled spikelets. Awn ½ inch.

Pulneys : Kodaikanal and below.

Gen. Dist. The Deccan and Ceylon.

ANTHOXANTHUM. F.B.I. 173 LVII.

Sweet-scented grasses. Spikelets with one flower or if two the upper only with ovary ; crowded into a dense spike-like panicle. Glumes 6, boat-shaped, keeled : gl. 1, one-veined, gl. ii similar and longer, gl. iii and iv shorter, keeled, hairy or not, two-fid with dorsal bent awn, gl. v and vi minute, without flowers. Stamens 2.

Species 4 or 5 in temperate regions.

Anthoxanthum odoratum *Linn.* ; *F.B.I.* vii 222 ; Vernal grass. Stems from a perennial rhizome ; glabrous.

Pulneys : in woods near Kodaikanal, introduced.

Gen. Dist. Native of Europe and North Asia. The cause of the scent of new-moon hay. I assume ours to be the European species, but the outer glume i is longer, and gl. iii and iv not hairy as in the latter.

SPOROBOLUS. F.B.I. v 73, LXX 1.

Perennial or annual grasses with flat or convolute leaves and very small one-flowered spikelets, jointed to their pedicels. Glumes awnless, not ribbed. Grain lying loose in the enclosing glume and palea.

Species 80 chiefly tropical.

Sporobolus piluliferus *Kunth.* ; *F.B.I.* vii 251, LXXI 11. Annual. Stems 3 to 10 inches, densely tufted. Leaves chiefly radical, narrowed from the base to the tip. Spikelets brown, $\frac{1}{20}$ to $\frac{1}{16}$ inch, crowded in a dense spike-like panicle, often interrupted. Gl. i without veins, gl. iii nearly twice as long, gl. ii longer than iii, both one-veined.

Nilgiris : Kotagiri (L. J. Sedgwick).

Gen. Dist. From Kashmir southwards to the Nilgiris and to Malacca.

Sporobolus indicus *Br.* ; *F.B.I.* vii 247, LXXI 12. A larger grass than the preceding, with rather narrow leaves and long spike-like panicles, the branches of which are closely covered to the base with the small spikelets, and erect close to the stem. Gl. i and ii both shorter than gl. iii, obtuse, one-veined.

Nilgiris : at Kotagiri ; a form with very narrow panicle abundant (L. J. Sedgwick).

Gen. Dist. All warm countries.

CALAMAGROSTIS. F.B.I. 173 LXXIV.

Narrow-leafed grasses, with narrow or spreading panicles of one-flowered spikelets, which are not jointed

to their pedicels but above the first two glumes and the rachilla not produced beyond gl. iii, which is awned.

Closely allied to AGROSTIS and DEYEUXIA, and the exact number of species indeterminate.

Calamagrostis pilosula *Hook. f. ; F.B.I.* vii 263, LXXIV 10. A very slender grass with stems of 1 to 2 feet and open panicles of small spikelets. Leaves narrow, usually very narrow, smooth : ligule largest on the upper leaves. Glume i smooth, round-backed ; gl. ii similar but slightly shorter ; gl. iii hyaline, minutely hairy, all over with sub-basal awn. Gl. i and ii, widely gaping, remain long after the grain (in gl. iii) has fallen. **t. 600.**

In wet situations on both plateaus.

Gen. Dist. Temperate and Alpine Himalayas from Kashmir to Sikkim Nilgiris, Ceylon.

ZENKERIA. F.B.I. 173 LXXVII.

Perennial long-leafed grasses, with small two-flowered spikelets in open panicles, not jointed to their pedicels, but the axis of the spikelet (rachilla) jointed at the hairy base and not produced beyond gl. iv. Glumes i and ii (empty) one-nerved ; gls. iii and iv, equal many-nerved.

Zenkeria elegans *Trin. ; F.B.I.* vii 270, LXXVII 1. A very pretty grass with pink hairy spikelets in a large soft panicle. Gl. iii and iv erect parallel, more than twice gl. i and ii, acuminate. **t. 601.**

Nilgiris and Pulneys : common on rocks or in stony places on both hill-tops.

Gen. Dist. South Deccan and Ceylon.

CŒLACHNE. F.B.I. 173 LXXVIII.

A genus of one species only.

Cœlachne pulchella *Br. ; F.B.I.* vii 270, LXXVIII 1. A small swamp grass. Stem 4 to 8 inches, very

slender. Leaves $\frac{2}{3}$ inch, on sheaths of $\frac{1}{2}$ inch. Spike $\frac{1}{4}$ to $\frac{3}{4}$ inch, sometimes over-topped by the last two leaves. Spikelets few, $\frac{1}{16}$ inch : glumes i and ii $\frac{1}{40}$ inch, concave, obtuse, persistent ; gl. iii about twice as long, and palea equal to it, glabrous ; gl. iv very small, intermediate in size between i and iii, hyaline very hairy, its palea similar to it. **t. 602.**

Pulneys : in upper swamps.

Gen. Dist. Tropical Asia, Australia, Madagascar.

AVENA. F.B.I. 173 LXXXII.

Oat-grass.

Annual or perennial grasses with flat leaves and two or more flowered spikelets not jointed to their pedicels but the rachilla jointed above the two basal, empty, glumes, and sometimes between the flowering glumes. Glumes i and ii thin, persistent, ribbed. Flowering glumes, three to seven veined, two-toothed or cleft at the top, with a long bent awn fixed at the back below the cleft.

Species chiefly in north temperate regions.

Avena aspera *Munro ; F.B.I.* vii 277, LXXXII 5 ; Rough Oat-grass. Stem 2 to 5 feet, slender, smooth, purplish, ending in a narrow panicle of erect spikelets. Leaves 6 to 12 inches ; sheath smooth ; ligule short. Spikelets with three or more flowers : glume i $\frac{1}{3}$ inch, acute ; gl. ii slightly longer and with longer point : gl. iii and following five to seven veined, scabrid, cleft about a third of the way down, the lobes acute but not awned, with a long bent and twisted awn arising below the cleft. Rachilla hairy between the glumes.

Pulneys : near Kodaikanal.

Gen. Dist. Khasi, Nilgiri and Pulney hills, Ceylon.

TRIPOGON. F.B.I. 173 LXXXVII.

Slender densely tufted grasses with rolled leaves and many-flowered spikelets (of the POACEÆ, p. 652) arranged in two rows and forming a very slender one-sided terminal spike. Basal glumes somewhat separated, one-nerved. Flowering glumes with two or four teeth, a strong awn fixed below the central cleft, and sometimes short awns terminating the lateral teeth. Styles short. Grain very narrow.

Species 10, in tropical and sub-tropical Asia and Africa.

Tripogon bromoides *Roth.; F.B.I.* vii 287, LXXXVII 8. Stem 6 to 12 inches, slender, smooth Leaves 2 to 5 inches, rolled, densely tufted at the base of the stem; upper stem-leaves few, about 1 inch on sheaths of 2 inches. Spikelets slender, about ½ inch, sessile in a simple terminal spike spreading outwards, olive-green in colour: glume i $\frac{1}{20}$ inch, close against the stem in a furrow in it, deeply notched on one side, membranous with stout keel; gl. ii ⅛ inch, mucronate; flowering glumes four-lobed, with a strong central awn attached to the back below the middle cleft, and two short awns terminating the outer pair of lobes and continuous with the two lateral veins. Palea about three-quarters as long as the glume finely jagged at the rounded end. Rachilla bearded at the base of each flower (easily seen at the flowering time because the glumes open widely).

Occurs on the downs in two distinct forms, side by side.

Var. **major** *Stapf.* Stem 2 to 4 feet. Lower leaves 5 to 6 inches narrow but flat. Spike 4 to 8 inches. Spikelets ⅔ inch. **t. 603.**

Var. **longifolius.** Stem $\frac{1}{2}$ to 2 feet. Leaves filiform as long as or shorter than the stem. Spikes 3 inches. Spikelets $\frac{1}{3}$ inch.

Gen. Dist. South-western Ghauts and Ceylon. Not northwards into Bombay.

ERAGROSTIS. F.B.I. 173 CIV.

Annual or perennial grasses with erect stems and narrow leaves. Spikelets many-flowered, not jointed at the base, nor between the glumes, and rachilla not produced beyond the top glume. Basal, empty, glumes much smaller than the spikelet, equal or unequal. Flowering glumes three-veined, deciduous from the rachilla : paleas two-veined, persistent on the rachilla or deciduous. Grain minute, free in the glume and palea.

Species about 100 in warm countries.

KEY TO THE SPECIES.

a { Spikelets ovate, flat, $\frac{1}{6}$ to $\frac{1}{4}$ inch long . . . . . . *b*
Spikelets lanceolate, $\frac{1}{6}$ inch glumes close acute . . . . 5. E. nigra.
Do. to $\frac{1}{3}$ inch, glumes not close acute . . . . . 4. E. tenuifolia.

b { Spike simple or spikelets few : glumes acute, pink . . 1. E. amabilis.
Spikelets often whorled : glumes obtuse . . . . . 2. E. stenophylla.
Panicle well-branched : glumes obtuse . . 3. E. major.

1. **Eragrostis amabilis** *Wight and Arnott ; Herb. Wight Prop.* 1777 *! ; F.B.I.* vii 317, CIV 8, Stem rooting at the lower nodes, 6 to 18 inches, slender. Leaves quite glabrous (mouth of sheath occasionally with one or two hairs, and a very small ligule) : blade 2 to 3 inches, strongly ribbed, acute, inclined to become rolled. Flowering

stem 5 to 6 inches above the last leaf, purplish. Spikelets $\frac{1}{4}$ to $\frac{1}{2}$ and by $\frac{1}{8}$ to $\frac{1}{6}$ inch, pink to dark purplish stalked in bunches, whorls, or on short $\frac{1}{2}$-inch spikes, at irregular intervals along the main axis of the panicle. Glumes $\frac{1}{16}$ to $\frac{1}{12}$ inch, acute with purple tips and green veins, the lateral veins straight and strong. Palea as long as its glume, scabrid along the two veins. Grain ellipsoid $\frac{1}{30}$ to $\frac{1}{50}$ inch. Common in gardens and short grass. **t. 604.**

Nilgiris: Pykara, Coonoor; flowering May. Pulneys: Kodaikanal.

Gen. Dist. All over India from Kashmir to Burma and Ceylon.

2. **Eragrostis stenophylla** *Hocket.*; *F.B.I.* vii 318, CIV 10. A stronger grass than E. amabilis. Stems densely tufted, up to 18 inches. Spikelets rather smaller, tending to oblong, dark green in colour, and often in fascicles or whorls. Glumes obtuse.

Pulneys: "Silver Cascade" below Kodaikanal.

Gen. Dist. Throughout India, Tropical Asia and Africa.

3. **Eragrostis major** *Host.*; *F.B.I.* vii 320, CIV 15. Spikelets ovate, flat, $\frac{1}{4}$ to $\frac{1}{3}$ by $\frac{1}{6}$ inch, dark green in a large panicle. Glumes obtuse round-backed in outline. Leaves with minute glands on the margins: mouth of sheath with a few long hairs.

Shevaroys: on roadsides near Yercaud and above.

Gen. Dist. Plains and lower hills of India, Burma and Ceylon: tropical and sub-tropical Asia and westwards to Europe

4. **Eragrostis tenuifolia** *Hochst.*; *F.B.I.* vii 322, CIV 19. Stems tufted, 1 to 2 feet. Leaves up to 6 inches long in large specimens, with a few hairs only, outside, at the junction of blade and stalk. Panicle 3 to 6 inches by $1\frac{1}{2}$ to 2 inches, its branches ramifying near the base.

Spikelets $\frac{1}{5}$ to $\frac{1}{4}$ inch by $\frac{1}{16}$ inch with about nine flowers (five to thirteen) glumes not closely imbricated, in outline straight-backed: glume i minute ($\frac{1}{50}$ inch) nerveless; gl. ii half as long again, one-nerved; flowering glumes $\frac{1}{10}$ to $\frac{1}{12}$ inch; anthers violet. Grain $\frac{1}{12}$ inch, slightly compressed, grooved on the dorsal side. **t. 605.** The spikelets are more oblong than is shown in the main figure.

Nilgiris: at Ootacamund common. Pulneys: in and below Kodaikanal down to 5,000 feet, etc.

Gen. Dist. Mountains of South India, tropical Africa.

At lower levels this is replaced by the very similar E. Wildenoviana.

5. **Eragrostis nigra** *Nees*, ex *Steud.*; *F.B.I.* vii 324, CIV 22. Stem about 18 inches (1 to 36), very leafy at the base. Leaves about 6 inches, bearded at the top of the sheath. Panicle 6 to 18 inches; its branches numerous, very slender. Spikelets up to $\frac{1}{6}$ by $\frac{1}{12}$ inch: glumes i and ii about $\frac{1}{12}$ inch, one-veined; flowering glumes slightly shorter; anthers yellow. Grain $\frac{1}{32}$ inch or smaller, on the dorsal side slightly grooved. **t. 606.**

Nilgiris: Ootacamund, Coonoor. Pulneys: near Kodaikanal and down to 5,000 feet. Horsleykonda.

Gen. Dist. Temperate and tropical India from Simla to Sikkim, Khasi hills, Deccan peninsula and Ceylon.

BRIZA. F.B.I. 173 CXVII.

Quake-grass.

Distinguished by the broad, tapering or triangular spikelets on very slender pedicels, in open panicles, and by the broad, nearly round, keelless glumes and broad paleas.

Species about 10 in temperate regions.

Spikelet $\frac{1}{6}$ inch green . . . . E. media.
Spikelet $\frac{1}{2}$ inch or more often purple at base . . E. maxima.

Briza minoria *Linn.* ; *F.B.I.* vii 336, CXVII 1 ; common Quake-grass. Stem about 15 inches, very slender. Leaves 3 inches, flat with long ligule. Panicle pyramidal 3 inches wide, with hair-like horizontal branches. Spikelets $\frac{1}{5}$ by $\frac{1}{6}$ inch with horizontal base. **t. 607.**

Nilgiris : about Ootcamund, introduced.

Gen. Dist. Europe, North Asia and temperate mountains of India and Tibet.

Briza major *Linn.* A European species, which might also occur in our area, has rather larger spikelets, in less open panicles, and short ligule.

Briza maxima *Linn.* Spikelets up to $\frac{1}{2}$ to $\frac{3}{4}$ inch by $\frac{1}{3}$ to $\frac{1}{2}$ inch or even larger. Lower glumes often partly dark purplish brown, seven-veined. Upper pubescent **t. 608.**

POA. F.B.I. 173 CXVIII.

Annual or perennial grasses with flat or rolled leaves, and panicles of two to six-flowered spikelets, breaking up between the flowers. Flowering glumes five to seven veined, slightly longer than their paleas.

Species 100, in temperate and cold countries. Britain has 8 (common meadow and lawn grasses).

Poa annua *Linn.* ; *F.B.I.* vii 345, CXVIII 17. Stem 6 to 12 inches, shortly creeping and rooting at the lower nodes, above bent at the nodes and erect, slightly compressed, smooth : internodes gradually lengthening upwards. Leaves 2 to 4 by $\frac{1}{12}$ to $\frac{1}{8}$ inch, smooth. Panicle up to $3\frac{1}{4}$ inches. Spikelets $\frac{1}{6}$ to $\frac{1}{5}$ inch. Grain $\frac{1}{25}$ to $\frac{1}{12}$ inch. **t. 609.**

An introduced weed, native of Europe and temperate Asia. Also Himalayas and Khasi hills.

BROMUS. F.B.I. 173 CXXII.

Annual or perennial grasses with narrow flat leaves and open panicles of long narrow spikelets, with round-backed, five to nine veined, awned, flowering glumes. Rachilla jointed between the flower-glumes, and not produced beyond the uppermost. Glumes i and ii persistent, unequal. Flowering glumes veined notched at the insertion of the awn. Grain adherent to the palea. Uppermost flowers often imperfect.

Species 45 in temperate regions and on tropical mountains.

Bromus asper *Murray ; F.B.I.* vii 358, CXXII 2. Stem slender 2 to 3 feet. Leaves very slender, 12 to 18 by $\frac{1}{8}$ to $\frac{1}{2}$ inch. Spikelets about $\frac{1}{2}$ inch : glume i $\frac{1}{6}$ inch ; gl. ii longer ; flowering glumes $\frac{1}{3}$ to $\frac{1}{2}$ inch, round-backed at the base, scabrid towards the top, with awn about as long. (Similar to t. 610 but leaves longer).

Pulneys : in moist places, near and below Kodaikanal.

Gen. Dist. Temperate mountains of India, Europe, North Africa, North Asia.

Bromus unioloides *H. B. & K. ; F.B.I.* vii 357. A stronger grass than the last, 3 or 4 feet high. Leaves $\frac{1}{3}$ inch or more wide, scabrid. Spikelets 1 inch or more long by $\frac{1}{6}$ inch wide. Shortly awned.

An introduction from America, reported in F.B.I. as at Darjeeling only.

FESTUCA.

Perennial grasses with flat, rolled or narrow leaves and open or narrow panicles of many-flowered spikelets. Flowering glumes rounded on the back, keeled towards the tip only, not bifid at insertion of awn. Ovary glabrous.

Festuca bromoides *L.* Leaves shorter than B. aspera. Flowering glumes not veined, narrow, tapering to the awn. **t. 610.**

An introduction from Europe.

BRACHYPODIUM. F.B.I. 173 CXXIV.

Perennial slender grasses with flat or rolled leaves and long slender spikes of narrow many-flowered, awned spikelets, sessile on and closely appressed to the axis.

Species 6 in temperate regions and on tropical mountains.

Brachypodium sylvaticum *Beauv.* ; *F.B.I.* vii 362. CXXIV 1. Stem 2 to 4 feet very slender. Leaves narrow, acuminate, more or less hairy. Spike 2 to 6 inches, nodding, its axis flattened. Spikelets $\frac{3}{4}$ to 1 inch by $\frac{1}{6}$ inch, green. Glume i $\frac{1}{8}$ inch strongly veined ; glume ii longer ; flowering glumes about $\frac{1}{2}$ inch, seven-veined, gradually narrowed into the slender erect awn of $\frac{1}{3}$ to $\frac{1}{2}$ inch.

On the downs of both plateaus.

Gen. Dist. Europe, North Asia, temperate mountains of India, South Africa.

APPENDIX

LYTHRACEÆ.

Rotala Fysonii *Blatter and Hallberg Journal, Bombay Natural History Society, Vol,* XXV, *p.* 709.—Stem reaching 10 cm. [4 in.] erect, stout, or slender, quadrangular in the upper part, simple or branched. Branches ascending, filiform, quadrangular. Leaves decussate, generally reddish in colour, sessile, broadly ovate-cordate and half amplexicaul, reaching 4 × 3 mm. [$\frac{1}{6}$ by $\frac{1}{8}$ inch], getting smaller upwards, acute, one-nerved.

Flowers present in most of the axils, solitary, sessile. Bracteoles 2, subulate, whitish, not as long as calyx. Calyx a little more than 1 mm. [$\frac{1}{25}$ inch] long, widely campanulate, scarious ; teeth 4, about as long as the tube, acutely triangular. Cornua 4, subulate, diverging, a little longer than the teeth. Petals 4, most minute. Stamens 4. Filaments inserted half-way down the tube, but continuing inside the tube to its base, linear, flattened, and with a red spot just above their insertion. Anthers included. Style very short. Capsule red, included in the calyx tube, four to three valved, generally the former red. Seeds half ellipsoidal, twice as long as broad, pale brown one face flat, one curved, very finely longitudinally striate.

This species comes near *R. pentandra,* but the habit is quite different. Besides, the flowers are always four merous and the capsule generally four-valved. **t. 611.**

Gen. Dist. Shevaroys on edge of marsh on "Green Hills." Also Anamalais.

The above description is Blatter and Hallberg's. My fresh specimens show no petals. The subulate cornua and sepal points give to the flower, especially when closed, a spiny appearance which is very characteristic.

APONOGETONACEÆ. F.B.I. in 170.

Only genus.

APONOGETON. F.B.I. 170 II.

Aquatic herbs with spikes of small flowers in which the parts are more or less in threes, like the LILIACEÆ, but the carpels are separate.

Aponogeton natans *Engl.* and *Kr*; *F.B.I.* vi 564 as A. monostachyon L. II. Flowers blue or lavender colour. Leaves oblong with rounded cordate base; blade about 1 by 4 inches; the petiole longer. **t. 563.**

Nilgiris: In Government House gardens. Planted but run wild in various parts of the Nilgiris.

Gen. Dist. Tropical Asia and Australia.

EUPHORBIACEÆ.

TRAGIA. F.B.I. 135 LXVII.

Perennial twining herbs with stinging hairs. Leaves alternate. Flowers in terminal and leaf-opposed racemes, the upper flowers in each male; the lower, fewer, female. Male flowers with usually 3 stamens. Female with 3 large sepals, and a three-lobed ovary. Styles 3 united below, spreading above. Fruit of three dry cocci, opening in two valves, each with one round seed.

Species about 5, chiefly tropical.

Tragia bicolor *Mig.*; *F.B.I.* v 465, LXVII 2. Hairy all over, the young parts golden brown. Leaves ovate cordate, acuminate. Male part of spike $\frac{3}{4}$ inch with many $\frac{1}{8}$-inch bracts. Female with 2 or 3 flowers only; sepals in fruit 1 inch, concave, densely covered with thick hairs.

Nilgiris: Kotagiri. Shevaroys, near Yercaud.

Pulneys. Flower summer, on the margins of sholas.

Gen Dist. 6,000 feet and below.

17 FEB 1933

INDEX

A

Acacia, 185
dealbata, t. 144
decurrens
longifolia, t. 145
melanoxylon, t. 143
retinodes
Acanthaceæ, 441
Acanthopale, 443
Acanthophippium, 570
bicolor, t. 494
Achyranthes, 487
aspera
bidentata, t. 426
Acrocarpus. 184
fraxinofolius
Acronychia, 102
laurifolia, t. 79
Actinodaphne, 505
Bourneæ
salicina
Adenostema, 314
Lavenia, t. 255
viscosum
Aerides, 578
crispum, t. 504
cylindricum, t. 506
radicosum
ringens, t. 505
Aeschynanthus, 439
Perrottetii, t. 379.
Ageratum, 315
conyzoides, t. 256
Albizzia, 187
lophantha
Alchemilla, 198
indica
Alismaceæ, 623
Allmania, 487
nodiflora
Allophylus, 127
serratus, t. 99
Alternanthera, 488
triandra
Alysicarpus, 160
racemosus, t. 122
Amarantaceæ, 486
Amaryllidaceæ, 600
American Night-shade, 489
Amla, 528
Ammania, 233
baccifera
rotundifolia
Ampelocissus, 124
aranosea
Anagallis, 371
arvensis
Anaphalis, 326
aristata, t. 273
Beddomei, t. 270
Bournei, t. 275
elliptica
Lawii, t. 272
leptophylla
marcescens
neelgerriana, t. 276
Notoniana
travancorica, t. 271
Wightiana, t. 274
Andrographis, 454
affinis
lobelioides, t. 396
lineata
Neesiana, t. 395
producta
stellata
Andropogon, 664
also under **Chrysopogon Heteropogon** and **Cymbopogon**)
contortus, t. 594
micranthus
Foulkesii, t. 594
lividus, t. 598
nilagiricus
polyneuros, t. 597.
Wightianus
zeylanicus, t. 595
Aneilema, 616
dimorphum, t. 553
lanuginosum, t. 554
Anemone, 4
rivularis, t. 2
Anisochilus, 469
dysophylloides, t. 407
suffruticosus
Anisomeles, 477
indica
Anotis, 274
decipiens
Leschenaultiana, t. 221
longiflora t. 222
monosperma t. 224
Wightiana, t. 223
Anthistiria, 670
ciliata, t. 599
imberbis
tremula
Anthoxanthum, 671
odoratum
Antidesma, 534
menasu, 466
Apocynaceæ, 392
Aponogetonaceæ, 684
Apongeton, t. 563
Aquifoliaceæ, 107
Araceæ, 622
Araliaceæ, 257
Ardisia, 376
humilis
rhomboidea
Arenaria, 42
neelgherrensis
Argyreia, 414
cuneata, t. 354
hirsuta, t. 353
neilgherrya
Arisaema, 622
Leschenaultii, t. 562
tortuosum, t. 561
Artemesia, 341
parviflora, t. 285
vulgaris
Arum, 622

Arundina, 575
bambusifolia, t. 499.
Arundinella, 659
fuscata, t. 589
mesophylla
setosa
villosa, t. 588
Asclepiadaceæ, 393
Asclepias, 404
curassavica
physocarpa
Asparagus, 608
Fysoni
laevissimus
Asphodel, 609
Asystasia, 454
crispata, t. 394
Atylosia, 170
Candollei
rugosa, t. 132
trinervia, t. 131
Australian Gum, 216
Avena, 674
aspera
Azadirachta, 103
indica

B

Baeckea, 215
virgata, t. 163
Balanophora, 523
indica
Balanophoraceæ, 522
Balsam, 78
Balsamineæ, 78
Bamboo, 650
Barberry, 14
Barleria, 453
involucrata, t. 393
Bastard Toadflax, 521
Bean, 167
Bed-straw, 294
Begonia, 244
floccifera
malabarica
Begoniaceæ, 244
Berberidaceæ, 14
Berberis, 15
aristata
Leschenaultii
tinctoria, t. 10
Bidens, 339
humilis, t. 283
pilosa, t. 282
Bilbery, 364
Biophytum, 76
Candolleanum
intermedium, t. 53
polyphyllum
Bitter-cress, 21
Bixaceæ, 28
Blackwood of Australia, 186
Bladderwort, 436
Blumea, 323
hieracifolia, t. 267
neilgherrensis, 266
macrostachya, t. 268
Wightiana
Bonnaya, 429
veronicaefolia, t. 368
Boraginaceæ, 412
Brachylepis, 395
nervosa, t. 332
Brachypodium, 681
sylvaticum
Bramble, 191
Brassaia, 259
capitata, t. 206
Brassica, 22
juncea, t. 14
Breynia, 530
patens, t. 461
rhamnoides
Bridelia, 527
retusa
Roxburghiana, t. 458
Brinjal, 417
Briza, 678
major
maxima, t. 608
minoria, t. 607
Bromus, 680
asper
unioloides
Broom, 137
Brunella, 477
vulgaris, t. 414
Bryony, 241
Bryophyllum, 209
calycinum
pinnatum
Buckthorn, 118
Buck-wheat, 490, 495
Bulbostylis, 641
capillaris
Bupleurum, 249
distichophyllum, t. 190
mucronatum, t. 198
plantaginifolium, t. 197
virgatum
Bur-marigold, 339
Burmannia, 555
candida
coelestis, t. 485
Burmanniaceæ, 555
Buttercup, 6
Buxaceæ, 523

C

Cabbage, 21
Cæsalpineæ, 178
Cæsalpinia, 179
pulcherrima
sepiaria, t. 138
Calamintha, 475
umbrosa, t. 412
Calamogrostis, 672
pilosula, t. 600
Calanthe, 574
veratrifolia, t. 498
Calceolaria, 425
mexicana, t. 365
Callitriche, 213
stagnalis
Cambellia, 435
cytinoides, t. 377
Camellia, 51
japonica
theifera
Campanulaceæ, 358
Campanula, 361
Alphonsii, t. 307
colorata
fulgens, t. 308
ramulosa, t. 306
Wightii
Campion, 38
Canavalia, 167
virosa, t. 130
Canthium 282
neilgherrinsis, *t.* 230
umbellatum.
Cape Gooseberry, 423
Cappar ideæ, 25
Caprifoliaceæ, 262
Capsella, 23
bursa-pastoris, t. 15
Cardamine, 21
africana, t. 12
hirsuta, t. 13.

Carex, 645
baccans
brunnea
hebecarpa
filicina, t. 581
foliosa
Jachiana
Lindleyana
longipes
maculata
myosurus, t. 582
muricata
nubigena, t. 579
phacota, t. 580
Carissa, 392
paucinervia, t. 330
Carraway, 246
Carrot, 246
Caryophyllaceæ, 36
Casearia, 238
coriacea
Cassia, 180
didymobotrya
Fistula, t. 139
lævigata, t. 140
Leschenaltiana, t. 142
mimosoides
occidentalis
tomentosa, t. 141
Catch-fly 38
Catmint, 475
Catsear, 355
Cayratia, 124
pedata, t. 97
Cedrela, 105
toona
Celastraceæ, 109
Celastrus, 114
paniculata, t. 88
Celay, 246
Celosia, 486
pulchella
Celtis, 537
tetrandra
Wightii, t. 471
Centella, 246
asiatica, t. 195
Centratherum, 306
phyllolaenum
Rangacharii
reticulatum, t. 246
Cephalostigma, 360
Schimperi
Cerastium, 39
glomeratum, t. 26
indicum, t. 25
vulgatum
Ceropegia, 400
ciliata, t. 343
elegans, t. 341
hirsuta
intermedia
pusilla, t. 340
sphenantha
Thwaitesii, t. 342
Chambania, 549
cuspidata
Charcoal-tree 539
Cheirostylis, 584
flabellata, t. 512
Chenopodiaceæ, 488
Chenopodium, 409
ambrosioides
Chickweed, 39, 40
Chlorophytum, 609
attenuatum
mabaricum, t. 544
Chloroxylon, 103
swietenia
Chomelia, 279
asiatica, t. 227
Christisonia, 435
bicolor,
tubulosa,
Saulierei, t. 376
Chrysogonum, 337
Chrysopogon, 666
Wightianus
zeylanicus, t. 595
Cinchona, 270
ledgeriana
succirubra
Cinnamomum, 502
macrocarpum
Perottetii
Wightii, t. 437
Cinnamon, 502
Cipdessa, 103
baccifera
fruticosa
Circæa, 237
alpina, t. 184
Cirrhopetalum, 567
Thompsoni
Cissampelos, 14
Pareira
Citron, 102
Citrus, 102
auriantium
decumana
medica
nobilis
Cleisostoma, 582
tenerum, t. 509
Clematis, 2
gouriana
Munroana
smilacifolia
theobromina
Wightiana, t. 1.
Cleome, 25
monophylla
Clerodendron, 461
serratum, t. 401
Clover, 153
Cobra-flower, 622
Cœlachne, 673
pulchella, t. 602
Cœlogyne, 570
angustifolia
corrugata
glandulosa
Mossiæ, t. 497
nervosa, t. 496
odoratissima, t. 495
Coleus, 468
barbatus, t. 406
malabaricus
Combretaceæ, 214
Commelinaceæ, 613
Commelina, 614
clavata, t. 551
cœlestis, t. 552
glabra
hirsuta, t. 550
salicifolia
Compositæ, 299
Convolvulaceæ, 414
Convolvulus, 416
flavus
Conyza, 321
ambigina, t. 264
japonica, t. 265
stricta, t. 263
Coriander, 246
Coronopus, 24
didyma
Corydalis, 18
lutea
Cotoneaster, 202
buxifolia, t. 155
Cotula, 341
australis
Cow Parsnip, 254
Crane's bill, 69
Crassulaceæ, 206
Creeping Jenny, 370
Crepis, 353
acaulis, t. 300
fuscipappa
japonica, t. 299

Crotalaria, 138
albida, t. 109
barbata, t. 113
Bourneæ, t. 107
calycina, t. 110
conferta
formosa, t. 112
Fysonii, t. 108
Leschenaultii, t. 111.
madurensis, t.115
Notonii, t. 116
obtecta
ovalifolia, t. 106
rubiginosa
scabrella, t. 105
semperflorens, t. 114
shevarayensis
striata
subperfoliata
Walkeri
Wightiana
Croton, 534
aromaticus
lacciferus, t. 467
Cruciferæ, 19
Cucurbitaceæ, 241
Cudweed, 326
Cuphea, 235
pinetorum, t. 180
Cupuliferæ, 553
Curculigo, 601
orchioides, t. 536
Curcuma, 597
neilgherrensis, t. 532
Cyanotis, 617
arachnoidea, t. 556
fasiculata
pilosa, t. 555
tuberosa
villosa
wightii, t. 555
cyclea, 14
Arnotti
Cymbopogon, 668
confeetiflorus
lividus, t. 598
polyneuros , t. 597
Cynanchum, 395
alatum, t. 333
Cynoglossum, 413
furcatum, t. 352
Cyperaceæ, 631
Cyperus, 635
digitalus
distans
teneriffæ
Cyphomandra, 422
betacea
Cytisus, 137
monospessulanus
scoparius, t. 104

D

Dalbergia, 175
congesta
Gardneriana
latifolia
sissoides
Dandelion, 356
Daphne, 509
Daphniphyllum, 533
glaucescens, t. 465
Datura, 423
arborea, t. 363
stramonium
Decachista, 61
crotonifolia
Dendrobium, 566
herbaceum
macrostachyum
nanum, t. 490
Derris, 176
canarensis, t. 136
Desmodium, 161
parvifolium, t. 125
rotundifolium
rufescens, t. 123
scalpe, t. 124
Dicraea, 497
dichotoma
Dicrocephala, 317
chrysanthemifolia
(and latifolia) tt, 257-259.
Didymocarpus, 440
Humboldtiana
tomentosa, t. 380
Digitalis, 429
purpurea
Dioscoraceæ, 603
Dioscorea, 604
Kalkapershadii
oppositifolia
Diospyros, 379
montana
Diplocentrum, 582
recurvum, t. 510
Diploclisia, 12
glaucescens
Dipsacaceæ, 297
Dipsacus, 298
Leschenaultii, t. 245
Disperis, 596
neilgherrensis, t. 530
zeylanica, t. 531
Disporum, 611
Leschenaultianum, t. 546.
Dock, 490, 495
Dodonæa, 128
viscosa, t. 100
Dolichos, 169
falcatus
Dorstenia 542
indica, t. 474
Dregea, 399
Droguetia, 552
diffusa, t. 483
Droseraceæ, 210
Drosera, 210
Burmanni, t. 159
peltata, t. 160
Dumasia, 165
villosa, t. 128
Dysophylla, 473
auricularia, t. 410
cruciata

E

Ebenaceæ, 379
Elæocarpaceæ, 64
Elæocarpus, 64
ferrugineus, t. 42
Munroii, t. 43
oblongus, t. 41
Elæocharis, 637
congesta, t. 574
Elæagnaceæ, 511
Elæagnus, 511
Kologa, t. 442
latifolia
Elatinaceæ, 45
Elatine, 45
americana
Elatostema, 547
acuminatum
lineolatum, t. 479
sessile, t. 478
surculosum, t. 480
Elytranthe, 518
capitellata, t. 451
loniceroides, t. 450
Embelia, 375
Basaal, t. 318
ribes, t. 317
viridiflora
Emex, 496
spinosa

Emilia, 343
scabra, t. 287
sonchifolia
zeylanica, t. 288.
Endopogon, 443
Eragrostis, 676
amabilis, t. 604
major
nigra, t. 606
stenophylla
tenuifolia, t. 605.
Willdenoviana, t. 573
Eria, 568
braccata, t. 491
nana, t. 492
polystachya, t. 493
Ericaceæ, 365
Erigeron, 319
alpinus, t. 261
canadense
linifolius, t. 264
mucronatum, t. 262
Eriobotrya, 203
japonica
Eriocaulaceæ, 624
Eriocaulon, 625
Brownianum, t. 565
Christopheri
collinum, t. 566
Gamblei
Geoffreyi, t. 567
horsley-kundæ var *megalocephala*
Mariæ, t. 567
melaleucum
nilagirense
odoratum
Oliveri
Richeanum
robustum, t. 564
Thwaitesii
Erodium, 70
cicutarium
moschatum, t. 46
Erythroxylon, 68
monogynum
Eucalyptus, 216
citriodora
ficifolia
globulus, t. 164
Eucomis, 612
undulata, t. 548
Eugenia, 219
Arnottiana, t. 167
calophyllifolium, t. 169
Jamb. t. 170
montanum, t. 168
Eulophia, 575
nuda, t. 501
pratensis, t. 500
Euonymus, 110
crenulatus, t. 85
Eupatorium, 316
glandulosum
odoratum
Euphorbiaceæ, 524, 684
Euphorbia, 526
helioscopia ·
Rothiana, t. 457
Eurya, 53
japonica, t. 35
Evening primose, 236
Everlasting, 326
Evodia, 98
Roxburghiana, t. 77
Exacum, 407
atropurpureum, t. 347
bicolor, t. 348
Perottetii
Wightianum, t. 346
Excœcaria, 536
crenulata, t. 470

F

Fagopyrum, 495
esculentum, t. 431
Fagræa, 406
obovata, t. 345
Fennel, 246
Festuca, 680
bromoides, t. 610
Ficus, 540
bengalensis
Benjamina
glomerata
guttata
infectoria
macrocarpa, t. 473
religiosa
Tsiela
Fimbristylis, 638
cyperoides
dichotoma
diphylla
Kingii, t. 575.
paupercula
subtrabeculata
uliginosa, t. 576
Flame-nettle, 468
Flax, 67
Fleabane, 319
Flemingia, 173
Grahamiana, t. 133
nilgheriensis, t. 134
procumbens
Foxglove, 429
Fragaria, 196
indica, t. 149
nilgherrensis, t. 150
Fuchsia, 236
corymbiflora, t. 183
Fuirena, 643
pubescens
Fumariaceæ, 18
Fumaria, 19
parviflora
Furze, 136

G

Galinsoga, 340
parviflora, t. 284
Galium, 293, 294
asperifolium, t. 241
javanicum, t. 240
rotundifolium
Garcinia, 50
Gambogia, t. 33
Garden "Geranium" 71
Gardneria, 405
Ovata, t. 344
Gaultheria, 366
fragrantissima, t. 311
Gentiana, 409
pedicellata, t. 349
quadrifaria, t. 349
Gentianaceæ, 406
Geranium, 69
nepalense, t. 45
Geraniaceæ, 68
Gesneraceæ, 439
Girardinia, 544
heterophylla
Glochidion, 530
fagifolium
neilgherrense, t. 463
velutinum, t. 462
Gnaphalium, 334
hypoleucum, t. 277
indicum
luteo-album
Gnetum, 554
scandens, t. 484

Gomphandra, 107
coriacea, t. 82
Gordonia, 54
obtusa, t. 36
Goose-grass, 294
Gorse, 136
Gram, 132
Gramineæ, 650
Grape-vine, 122
Grass, 650
Grass of Parnassus, 204
Grewia, 62
Barberi
Gamblei
heterotricha
obtusa
tiliæfolia
Guelder-rose, 262
Guttiferæ, 49
Gymnema, 396
hirsuta, t. 335
montanum
Gymnostemma, 244
pedata
Gymnosporia, 115
Heyneana
ovata, t. 89
Gynura, 342
nitida, t. 286
travancorica

H

Habenaria, 584
aristata, t. 526
bicornuta, t. 524
cephalotes, t. 517
crassifolia, t. 522
crinefera
decipiens
digitata, t. 513
elliptica, t. 520
galeandra
grandiflora, t. 515
Heyneana, t. 521
jantha
longicalcarata, t. 519
longicornu, t. 518
obcordata, t. 528
Perrottetiana, t. 523
rariflora, t. 516
Richardiana
susannae, t. 527
torta, t. 525
travancorica, *t.* 514
Hæmodoraceæ, 599
Halenia, 411
Perrottetii, t. 351
Haloragiaceæ, 212
Hare's-ear, 249
Hatpin-flower, 625
Hawksbeard, 353
Hedyotis, 271
Hedychium, 599
coronarium, t. 533
Helichrysum, 335
buddleoides, t. 278
Hookerianum
Wightii
Hemp-agrimony, 220
Heptapleuron, 259
Heracleum, 254
Candeleanum
Hookerianum
pedatum, t. 205
rigens, t. 202
Sprengelianum, t. 204
zeylanicum, t. 203
Heron's-bill, 70
Heteropogon, 667
contortus, t. 596
Heynea, 104
trijuga, t. 80
Hibiscus, 60
angulosus, t. 40
Hill guava, 215
Holly, 108
Holly hock, 55
Honey suckle, 266
Houndstongue, 413
Hoya, 399
ovalifolia
Wightii, t. 339
Hydnocarpus, 29
alpina, t. 19
Hydrobryum, 498
olivaceum
Hydrocotyle, 246
asiatica, *t.* 195
conferta, t. 193
javanica, t. 192
rotundifolia, t. 194
Hypericineæ, 45
Hypericum, 45
Hookerianum, t. 30
humifusum
japonicum, t. 32
mysorense, t. 29
nepaulense
Wightianum, t. 31
Hypochæris, 355
glabra, t. 301
Hypoxis, 601
aurea, t. 535

I

Icacinaceæ, 105
Ilex, 107
denticulata, t. 83
Gardneriana
Wightiana, t. 84
Ilicineæ, 107
Ilysanthes, 428
hyssopioides, t. 369
veronicæfolia, t. 368
Impatiens, 78
acaulis, t. 58
Balsamina
Beddomei, t. 55.
campanulata, t. 74
Clavicornu, t. 55
chinensis, t. 63
cuspidata
flaccida
floribunda
fruticosa, t. 72
Goughii, t. 75
Henslowiana, t. 71
inconspicua, t. 65
laticornis, t. 59
latifolia, t. 69
Lawsoni
Leschenaultii, t. 68
Levingei, t. 56
modesta, t. 57
Munroii
Neo-Barnesii, t. 62
nilagirica, t. 60
omissa
orchioides, t. 61
phœnicea, t. 76
pusilla, t. 65
rufescens, t. 66
scabriscula, t. 70
scapiflora, t. 54
tenella, t. 64
tomentosa, t. 67
Tangchee
viscida, t. 73
Indigo, 155
Indigofera, 155
eudecaphylla
pedicellata, t. 118
pulchella, t. 119
Iphigenia, 612
indica, t. 547

Isachne, 654
australis, t. 584
Gardneri, t. 585
Kunthiana, t. 583
Ischæmum, 663
ciliare, t. 593
Isonandra, 379
Candolleana, t. 320
Perrottetiana
Ixora, 284
Notoniana, t. 231

J

Jasminum, 385
bignoniaceum, t. 327
brevilobum, t. 326
cordifolium, t. 325
pubescens
rigidum
sambac
Juncaceæ, 619
Juncus, 620
bufonius, t. 559
glaucus, t. 557
prismatocarpus, t. 558
Justicea, 456
latispica
nilgherrensis, t. 397
simplex, t. 398

K

Kalanchœ, 207
floribunda
grandiflora, t. 158
Klugia, 441
Notoniana, t. 381
Knot-grass, 490
Knoxia, 281
corymbosa
mollis, t. 228
Wightiana, t. 229
Korthosella, 518
japonica, t. 452
Kyllinga, 633
cylindrica, t. 569
melanosperma, t. 568

L

Labiatæ, 462
Lactuca, 356
hastata, t. 302
Lady's-mantle, 198
Lady's tresses, 583
Laggera, 325
alata, t. 269
pterodonta
Lantana, 459
aculeata
Laportea, 543
terminalis, t. 475
Lasianthus, 289
acuminatus
capitulatus
ciliatus
coffeoides, t. 237
venulosus, t. 236
Lasiosiphon, 510
eriocephalus, t. 441
Lauraceæ, 501
Lecanthus, 547
Wightii
Leguminoseæ, 132
Lentibulariaceæ, 436
Leonurus, 478
sibirica
Leptodesmia, 160
congesta
Lespedeza, 158
sericea
Leucas, 478
angularis, t. 415
helianthemifolia, t. 418.
hirta, t. 422
lamifolia, t. 421
lanceæfolia, t. 419
linifolia, t. 423
marroboides
rosmarinifolia, t. 416
suffruticosa, t. 417
ternifolia
vestita, t. 420
zeylanica
Ligustrum, 390
Perottettii, t. 329
Roxburghii
Liliaceæ, 604
Lilium, 610
neilgherrense, t. 545
Lily, 610
Limnophila, 427
hypericifolia, t. 366
Linaceæ, 67
Lindenbergia, 426
urticæfolia
Linum, 67
mysorense, t. 44
Liparis, 565
atropurpurea
viridiflora
Walkeriæ
Lipocarpha, 643
argentea
Liriodendron, 10
Litsæa, 505
deccanensis
ligustrina, t. 430
Stocksii
tomentosa
Wightiana, t. 439
Lobelia, 359
excelsa, t. 304
nicotianæfolia
trigona, t. 303
Loganiaceæ, 404
Lonicera, 266
Leschenaultii, t. 213
ligustrina, t. 214
Loosestrife, 369
Loranthaceæ, 512
Loranthus, 512
capitellatus, t. 451
cuneatus, t. 446
intermidius
longiflorus, t. 447
loniceroides, t. 450
memecylifolius, t. 449
neelgherrensis, t. 448
obtusatus, t. 443
recurvus, t. 445
tomentosus, t. 444
Luisia, 577
tenuifolia, t. 503
Luzula, 621
campestris, t. 560
Lysimachia, 369
deltoides, t. 314
Leschenaultii, t. 313
Lythraceæ, 233, 683

M

Macaranga, 536
indica, t. 469
Machilus, 504
macrantha
Madder, 268
Mæsa, 372
indica
Perrottitiania, t. 315
Magnoliaceæ, 9
Mahogany, 103

Mahonia, 16
Leshenaultii, t. 11
Mallotus, 535
albus
philippinensis, t. 468
Mallow, 56
Malva, 56
verticellata
Malvaceæ, 55
Mappia, 106
fœtida, t. 81
ovata
tomentosa
Margosa, 103
Marsdenia, 399
volubilis, t. 338
Mariscus, 637
cyperinus, t. 573
var Bengalensis
Marrow, 241
Mazus, 426
rugosus, t. 93
Meadow-rue, 4
Medinilla, 228
malabarica
Melastomaceæ, 223
Meliaceæ, 103
Melia, 103
azedarach
Melicope, 99
indica
Meliosma, 129
Arnottiana, t. 102
Wightii, t. 101
Melothria, 242
leiosperma, t. 191
mucronata
perpusilla, t. 190
Melon, 241
Memecylon, 231
angustifolium
flavescens
Lushingtonii
malabaricum, t. 178
Menispermaceæ, 11
Michelia, 10
champaca
nilagirica, t. 8
Micromeria, 474
biflora, t. 411
capitellata
Microstylis, 563
densiflora, t. 489
Rheedii
Stocksii
versicolor
Wallichii
sp unknown, t. 488
Microtropis, 111
latifolia
microcarpa
ovalifolia, t. 87
ramiflora, t. 86
Mignonette, 24
Milkwort, 32
Mimoseæ, 183
Mimosa, 184
pudica
Mistletoe, 519
Modiola, 57
caroliniana t. 37
Molineria, 602
finlaysoniana
Moonia, 337
Arnottiana
heterophylla, t. 279
Moraceæ, 540
Mucuna, 166
hirsuta, t. 129
Mukia, 242
Murraya, 101
exotica
Koenigii
Mussaenda, 279
frondosa
hirsutissima, t. 226
Mustard, 22
Myriactis, 318
Wightii, t. 260
Monocotyledons, 555
Myriophyllum, 213
intermedium, t. 162
Myrsinaceæ, 372
Myrsine, 374
capitallata, t. 316
Myrtaceæ, 215
Mysore thorn, 180

N

Naravelia, 4
zeylanica
Nasturtium, 22
officinale
Neem, 103
Neolitsæa, 508
zeylanca, t. 440
Nettle Tree, 537
Nicandra, 423
physaloides, t. 362
Nightshade-American, 337
Notonia, 344
shevarayensis, t. 290
Walkeri, t. 289
Nymphæaceæ, 17
Nymphæa, 17
lotus
speciosum
stellata

O

Oak, 553
Oat-grass, 674
Oberonia, 561
Brunoniana, t. 486
platycaulon
verticillata
Wightiana, t. 487
Oenothera, 236
odorata
tetraptera, t. 181
rosea, t. 182
Old man's beard, 2
Oldenlandia, 271
articularis, t. 218
hirsutissima
Heynei, t. 216
umbellata
purpurascens
stylosa, t. 217
swertioides, t. 219
verticillaris, t. 220
viscida
Olea, 388
Bournei
glandulifera, t. 328
polygama
Oleaceæ, 384
Olive, 388
Mock, 65
Onagraceæ, 235
Ophiopogon, 600
intermedius, t. 534
Ophiorrhiza, 278
Brunonis, t. 225
pykarensis
Roxburghiana
Oplismenus, 658
compositus
undulatifolius, t. 587
Orange, 102
Orchidaceæ, 556
Orobanchaceæ, 434
Orobanche, 434
Orthosiphon, 464
rubicundus

Osbeckia, 223
cupularis, t. 171
lineolata
Leschenaultii, t. 174
reticulata, t. 175
rosea, t. 172
Wightiana, t. 173
Osyris, 522
arborea, t. 455
Oxalideæ, 72
Oxalis, 72
corniculata, t. 47
corymbosa.
latifolia, t. 51
pes-capræ, t. 52
pubescens, t. 48
tertaphylla, t. 50
variabilis, t. 49
Oxtongue, 352

P

Panicum, 656
indicum
patens
repens
villosum, t. 586
Pansy, 20
Papilionaceæ, 132
Parnassia, 204
mysorensis, t. 157
Wightiana, t. 156
Parochetus, 154
communis, t. 117
Parsnip, 246
Parthenocissus, 123
neilgheriensis, t. 96
Passifloraceæ, 239
Passiflora, 239
calcarata, t. 186
edulis, t. 187
Leschenaultii, t. 185
Passion flower, 239
Paspalum, 653
Perrottetii
Pavetta, 285
breviflora, t. 232
Pedicularis, 433
Perottetii, t. 375
zeylanica, t. 374
Pelargonium, 71
glossularioides
Pentapanax, 259
Leshenaultii
Pennywort, 247
Peperomia, 500
dindigulensis, t. 436
reflexa, t. 435
Wightiana
Pepper, 498
Pepper-elder, 500
Peristylus, 591
aristatus, t. 526
Richardianus, t. 524
spiralis, t. 525
Persian lilac, 103
Phaseolus, 167
calcaratus
sublobatus
trinervius
Phoebe, 508
lanceolata
paniculata
Wightii
Photinia, 200
Lindleyana, t. 153
Notoniana, t. 154
Phyllanthus, 528
emblica
Gardnerianus, t. 460
Macræi, t. 460
Rheedii, t. 459
simplex
Phyllompha, 594
obcordata, t. 528
Physalis, 423
peruviana, t. 361
Phytolacca, 489
dioica, t. 427
Phytolaccaceæ, 489
Picris, 352
hieracioides, t. 298
Pilea, 544
Kingii
stipulosa
trinervia, t. 477
Wightii, t. 476
Pimpernel, 265
Pimpinella, 252
Candolleana, t. 200
Leschenaultii
pulneyensis, t. 201
Piperaceæ, 498
Piper, 498
brachystachyum, t. 433
Schmidtii, t. 434
Wightii
Pittosporaceæ, 30
Pittosporum, 30
dasycaulon
tetraspermum, t. 20
nilghirense
floribundum
Plantain-orchid, 571
Plantago, 484
asiatica, t. 425
lanceolata
major, t. 425
Plantaginaceæ, 484
Platanthera, 593
obcordata, t. 529
susannæ, t. 527
Plectranthus, 464
Bishopianus
Bourneæ, t. 405
Cœtsa, t. 403
Coleoides, t. 404
fruticosus
menthoides
nilgherricus
Wightii, t. 402
Plectronia, 282
didyma
neelgherrensis, t. 230
Pleroma, 228
Poa, 679
annua, t. 609
Podostemaceæ, 497
Pogostemon, 470
atropurpurens
Heyneanus
mollis
nilagiricus
paludosus
pubescens, t. 408
rotundatus
speciosus, t. 409
Wightii
Pokeweed, 489
Pollinia, 662
phaeothrix, t. 592
quadrinervis, t. 591
Polycarpea, 44
corymbosa
Polycarpon, 44
tetraphyllum, t. 28
Polygala, 32
arillata, t. 21
javana
rosmarinifolia, t. 22
sibirica, t. 23
Polygalaceæ, 32
Polygonaceæ, 490

Polygonum, 490
alatum, t. 428
chinense, t. 429
flacidum
hydropiper
glabrum
minus
molle
pedunculare
punctatum, t. 428
rude
sphærocephalum
strigosum, t. 430
Polystachya, 577
purpurea, t. 502
Pomaderris, 121
lanigera, t. 94
Poor man's weather glass, 372
Porana, 416
malabarica
paniculata
volubilis
Potato, 417
Potentilla, 197
Kleiniana
Leschenaultiana, t. 151
Pouzolzia, 550
auriculata
Bennettiana, t. 482
cymosa
Wightii, t. 481
Primulaceæ, 368
Prinsepia, 190
utilis, t. 147
Privet, 390
Prunus, 189
persica
Psoralea, 157
pinnata, t. 120
Psychotria 286
bisulcata, t. 235
congesta, t. 233
elongata, t. 234
Pterocarpus, 176
santalinus, t. 135
Pumelo, 102
Pumpkin, 241
Pycreus, 634
angulatus
capillaris var
globosus, tt. 570, 571
nilgiricus
sanguinolentus
unioides, t. 572
Pygeum, 189
Gardneri, t. 146
sisparense
Pyrus, 204
communis
malus

Q

Quake-grass, 678
Quercus, 553
ilex

R

Ragwort, 346
Randia, 280
dumetorum
Ranunculaceæ, 1
Ranunculus, 6
diffusus
muricatus, t. 7
reniformis, t. 4
subpinnatus, t. 5
Wallichianus, t. 6
Rapanea, 373
Thwaitesii
Wightiana, t. 316
Rauwolfia, 393
densiflora, t. 331
Red Liberty Cap, 88
Resedaceæ, 24
Reseda, 24
luteola
Rhamnus, 118
dahuricus
virgatus, t. 91
Wightii, t. 92
Rhamnaceæ, 116
Rhododendron, 367
arboreum
nilagiricum, t. 312
Rhodomyrtus, 218
tomentosa, t. 166
Rhubarb, 490
Rhyncosia, 172
filipes
rufescens
viscosa
Rhyncospora, 644
glauca
Rosa, 199
indica
Leschenaultiana, t 152
Rosaceæ, 187
Rose, 199
Rotala, 233
densiflora
Fysonii, t. 611
rotundifolia, t. 179
Rubia, 293
cordifolia, t. 239
Rubiaceæ, 268
Rubus, 191
ellipticus
farholmianus
fulvus
lasiocarpus
moluccanus
niveus
recemosus, t. 148
rugosus
Rumex, 495
acetosella
nepalensis, t. 432
Rungia, 458
læta, t. 399
latior
Rush, 619
Rutaceæ, 97

S

Sabiaceæ, 129
Saccolabium, 580
filiforme, t. 507
pulchellum, t. 508
Sac-orchid, 580
Sagina, 42
procumbens
Sagittaria, 624
sagitifolia
Saint John's Wort, 36
Salicaceæ, 553
Salix, 553
tetrasperma
Samydaceæ, 238
Sandwort, 42
Sanicula, 248
europæa, t. 196
Santalaceæ, 521
Sandalwood, 521
Sapindaceæ, 127
Saponaria, 38
vaccaria
Sapotaceæ, 376
Sarcococca, 524
trinervia, t. 456
Sarcostemma, 396
brevistigma, t. 334

Satinwood, 103
Satyrium, 595
neilgherrensis, t. 529
nepalense, t. 529
Saxifragaceæ, 204
Schefflera, 259
capitata, t. 206
micarntha
racemosa, t. 207
rostrata
stellata, t. 208
venulosa
Wallichiana
Scirpus, 641
fluitans
mucronatus, t. 577
subcapitatus, t. 578
Scleria, 644
cochinchinensis
Scolopia, 28
crenata, t. 18
Scrophulariaceæ, 424
Scutia, 120
myrtina, t. 93
Scutellaria, 475
Colebrookiana
rivularis
violacea, t. 413
Sedge, 631
Senbiera, 24
Self-heal, 477
Senecio, 345
aranoseus
candicans
corymbosus
Hohenacheri, t. 295
intermedius
lavandulæfolius, t. 292
Lawsoni
lesingianus
nilgheryanus
polycephalus, t. 294
saxatilis
Walkeri
Wightii, t. 293
Wightianus, t. 296
zeylanicus, t. 291
Serpicula, 212
brevipes, t. 161
hirsuta
indica
Setaria, 661
glauca, t. 590
Shaddock, 102
Shuteria, 165
vestita, t. 127
Sida, 58
acuta
rhombifolia
rhomboidea, t. 38
Sideroxylon, 377
tomentosum, t. 319
Segesbeckia, 338
orientalis, t. 280
Silene, 38
gallica, t. 24
Silverweed, 136
Skullcap, 475
Smilax, 605
aspera, t. 538
macrophylla, t. 540
prolifera, t. 542
Wightii, t. 541
zeylanica, t. 539
Smithia, 159
blanda, t. 121
gracilis
hirsuta
Solanaceæ, 416
Solanum, 417
auriculatum, t. 356
convolvulus
denticulatum
gigantium
indicum
læve, t. 355
macrophyllum
nigrum
robustum, t. 360
seaforthianum
sisymbrifolium, t. 359
Wightii, t. 357
Solomon's Seal, 411
Sonchus, 357
arvensis
Sonerila, 229
elegans
grandiflora, t. 177
pulneyensis
rotundifolia
speciosa, t. 176
Sophora, 177
glauca, t. 137
Sopubia, 432
delphinifolia, t. 372
trifida, t. 373
Sorrel, 490, 495
Sowthistle, 357
Spergula, 43
arvensis, t. 27
Spermacoce, 293
ocymoides, t. 238
Spindle-tree, 110
Spilanthes, 338
acmella, t. 281
Spiraea tree, 91
Spiranthes, 583
australis, t. 511
Sporobolus, 672
indicus
piluliferus
Spurge-laurel, 509
Spurge, 526
Stachytarpheta, 460
mutabilis
Staphyleaceæ, 125
Stellaria, 40
media
paniculata
saxatilis
Stephania, 12
japonica, t. 9
Sticky-seed, 30
Stitch-wort, 40
St. John's Wort, 45
Stork's-bill, 70
Strawberry, 196
Striga, 431
lutea, t. 371
Strobilanthes, 443
amabilis
asper
consanguineus
cuspidatus, t. 385
foliosus, t. 383
gossypinus
homotropus, t. 392
Kunthianus, t. 384
luridus, t. 391
micaranthus
neilgherrensis
papillosus
Perottetianus, t. 387
pulneyensis, t. 386
sessilis, t. 389
sexennis, t. 392
urceolaris
violaceus
Wightianus, t. 388
Zenkerianus, t. 390
Stylocoryne, 286
lucens
Styraceæ, 380
Sundew, 210

Symplocaceæ, 380
Symplocos, 380
foliosa, t. 322
microphylla
obtusa, t. 323
pendula, t. 324
pulchra
spicata, t. 321
Swertia, 410
corymbosa, t. 350
minor
trichotoma
Swietenia, 103
mahagoni
Syncarpea, 217
glomulifera
laurifolia
Syzygium, 219
Arnottianum, t. 167
calophyllifolium, t. 169
jambolanum, t. 170
montanum, t. 168

T

Tacsonia, 241
mollissima, t. 188
Taraxacum, 356
officinale
Teasel, 298
Tephrosia, 157
candida
tinctoria
Terminalia, 214
chebula
Ternstroemiaceæ, 51
Ternstroemia, 51
javanica, t. 34
Tetrastigma, 123
muricatum, t. 95
Teucrium, 484
Wightii, t. 424
Thalictrum, 5
javanicum, t. 3
Thesium, 521
Wightianum, t. 454
Thorn apple, 423
Thunbergia, 442
grandiflora
tomentosa, t. 382
Thyme, 474
Thymeleaceæ, 509
Tibouchina, 228
semicandra
Tiliaceæ, 61
Toadflax, Bastard, 521
Toddalia, 100
aculeata
asiatica, t. 78
Torenia, 427
asiatica, t. 367
Tragia, 684
bicolor
Traveller's Joy, 2
Trema, 539
orientalis, t. 472
Tricholaema, 658
Wightii.
Trichosanthes, 242
anguina
palmata
villosula, t. 189
Trifolium, 153
dubium
pratense
repens
Tripogon, 675
bromoides var major t. 603
bromoides var longifolius
Triumfetta, 62
pilosa
Tulip-tree, 10
Turmeric, 597
Turpentine tree, 217
Turpinia, 125
nepalensis, t. 98
pomifera
Twin-spur, 595
Tylophora, 397
Iphysia
mollissima, t. 336
tenuis, t. 337

U

Ulex, 136
europeus, t. 103
Umbelliferæ, 245
Ulmaceæ, 537
Urena, 59
lobata, t. 39
Urticaceæ, 543
Utricularia, 436
coerulea
graminifolia, t. 378-*a*
rosapurperea, t. 378-*c*
Smithiana
striatula, t. 378-*d*
uliginosa
Wallichiana, t. 378-*b*

V

Vacciniaceæ, 363
Vaccinium, 364
Leschinaultii, t. 309
nilgherrense, t. 310
Valerianaceæ, 295
Valerian, 295
Valeriana, 295
Arnottiana, t. 242
Beddomei
hardwickii
Hookeriana, t. 243
Leschenaultii, t. 244
Vandellia, 428
sessiliflora
Verbascum, 425
thapsus, t. 364
Verbena, 460
bonariensis
venosa, t. 400
Verbenaceæ, 459
Vernonia, 308
Bourneana, t. 253
Bourdillonii
conyzoides, t. 254
Fysoni, t. 250
monosis, t. 247
pectiniformis, t. 248
peninsularis, t. 251
pulneyensis, t. 249
Ramaswamii
saligna, t. 252
shevaroyensis
Veronica, 430
agrestis, t. 370
javanica
Viburnum, 262
acuminatum, t. 209
coriaceum, t. 210
erubescens, t. 212
hebanthum, t. 211
Vicia, 164
sativa, t. 126
Vigna, 168
vexillata
Wightii
Viola, 25
canescens
distans
patrinii, t. 16
serpens, t. 17

Violaceæ, 25
Violet, 25
Viscum, 519
japonicum, t. 452
monoicum
orbiculatum
ramosissimum
verruculosum, t. 453
Vitaceæ, 122
Vitis, 122
anamalayana, t. 96

W

Wahlenbergia, 360
gracillis, t. 305
Wattle, 185
Webera, 279, 286
corymbosa
Wendlandia, 270
notoniana, t. 215
White Cedar, 103
Wintergreen, 365
Wood Germander, 484
Wood-Sorrel, 72
Wortle-berry, 258

X

Xanthoxylum, 99
tetraspermum
Xyris, 613
shoenoides, t. 549
Xyridaceæ, 613

Y

Yellow Ground Star, 602
Yellow-wood, 99

Z

Zehneria, 242
Zenkeria, 673
elegans, t. 601
Zephyranthes, 603
carinata, t. 537
tubispatha
Zingiberaceæ, 597
Zizyphus, 117
incurva
rugosa, t. 90